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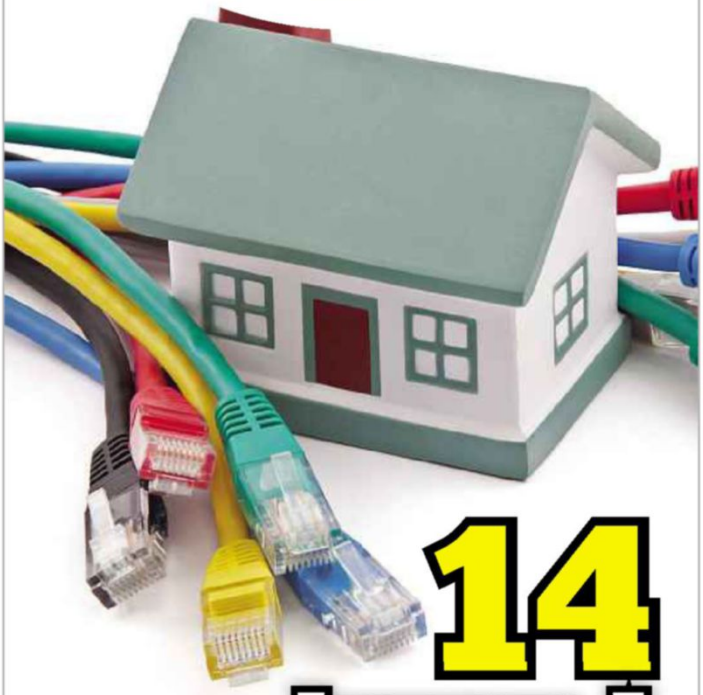

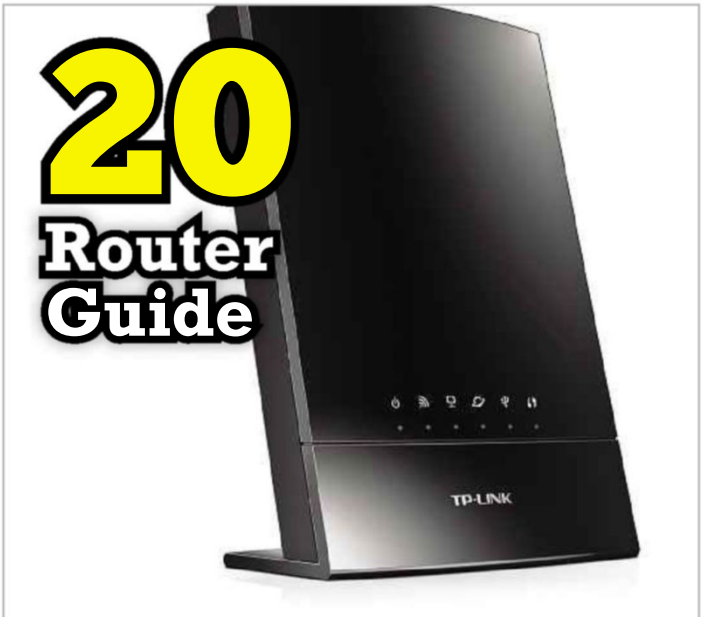

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Tips To Improve Your Wireless Network

Poor wi-fi can be a real pain, but thankfully there things you can do to improve matters

Most people don't have a lot to do with their networks, and that's understandable. Given the importance of a wireless network in any connected household, it's easy to convince yourself that changing anything could lead to catastrophic consequences. But while this mentality might protect you from unwanted failures, it also prevents you from improving your network as well. Rather than live in fear, why not try out some of our top wireless networking tips and see how good things could really be.

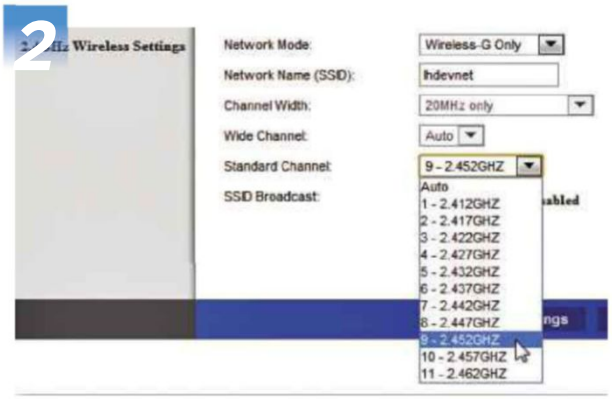
1 Move Your Router For Best Performance

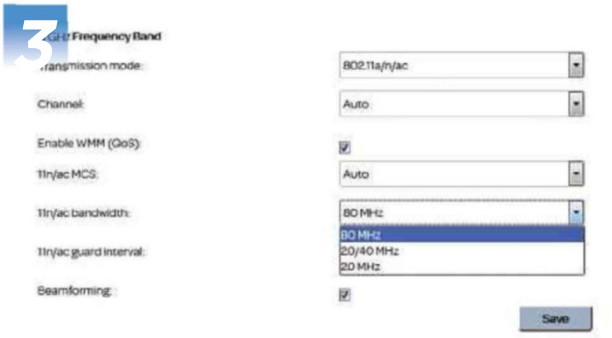
Perhaps the most frequently ignored piece of advice regarding wireless networks is that you should put your router in the place that makes most sense for you. If your hardware was installed by your ISP's engineer, then it's likely that they've left it close to the location where your data connection enters the house, whether that's the phoneline or a TV cable – often on the ground floor of a house, and usually near the front door. This might be the most convenient place for the engineer to install a router, but in case you're under any illusions, it's almost never the best place for you to actually connect to it.

The position of the access point can have a significant effect on speed, reliability and even security. To get the best speed and coverage out of your network, you have to minimise the distance between your wireless device and the wireless access point. For most people, that means putting your router somewhere towards the middle of the house, in the most central location possible.

To explain why that makes sense, imagine your network coverage as a sphere around the antenna. The practical range in any direction is normally about 10 metres, so that means you have a 20-metre sphere to play with. The further you get from the antenna, the weaker the signal becomes, and weak signals are slower and less reliable. If you position your router against an external wall, almost half of that influence is being wasted. At best, it's being uselessly absorbed by a wall. At worst, it's allowing people next door or even across the street to detect your network just as easily as you can!

The ideal place for a router is the one that creates the shortest straight-line distance to as many devices as possible, and ideally somewhere out in the open, rather than inside





a cupboard or closet. This gives the strongest signal to as many devices as possible, improving speed and reliability, and it also has the advantage of making it that little bit harder for others to find and connect to your wireless hub.

2 Reduce Interference By Swapping Channels

As wireless networking has become more and more popular, the chance of someone else's wireless network causing interference has grown too. Interference is caused when two or more networks using the same broadcast channel 'overlap'.

Overlaps of any kind can cause signal interference, and if two access points are positioned near to one another and running on similar channels, they'll detect traffic meant for the other network as well as their own. This causes congestion, because the only way to tell whether the traffic is intended for one network or another is to receive, process and then discard it – something that slows the system down and leaves less room for proper traffic.

If your wireless network appears to be suffering from interference, one possible solution to the problem is to change the channel it communicates on. It's an easy change to make and one that requires no additional configuration other than on your router, and if the interference is coming from another network it'll fix it forever.

The number of the channels in use depends on the network protocol and band, but the important thing to note is that 2.4GHz networks (Wireless G and N) only has three non-overlapping channels – 1, 6 and 11 – while 5GHz networks (Wireless N and AC) have channels that are pre-defined with no overlap. If you think you're getting interference from someone else's network, switch your 2.4GHz network to channel 1, 6 or 11 or switch your 5GHz network to any other available channel. If the problem is indeed that someone else nearby is using the same channel as you, this will eliminate all interference and restore your network's full speed.

3 Improve Reliability By Reconfiguring Your Channel Bandwidth

If you're not experiencing interference, then there are different changes you can make to your channels to improve performance. Most routers default to using a relatively narrow band covering each channel, just 20MHz wide, to minimise channel overlap. However, Wireless N supports bandwidths of up to double that amount. Try setting your router's channel bandwidth to 40MHz and see if it makes a difference.

In theory, using a wider bandwidth will give you greater reliability and speeds, but at the cost of a much higher likelihood of interference with other networks. Running your network hardware at 20MHz bandwidth means each channel will overlap with four other channels – two before and two after – but running at 40MHz will cover twice as much space and mean your transmissions overlap with two-thirds of the entire spectrum available to 2.4GHz networks. The chance that someone else is running a network within that space is quite high.

Still, it's worth a go, especially if you're in a remote area. At best it'll make your network stronger and faster, and at worst it'll cause a little interference, which is easily corrected by moving back to the 20MHz bandwidth – so it's not like there's a lot at stake if things don't work out!

> **"Imagine your network coverage as a sphere around the antenna"**

4 Install A High-gain Or Directional Antennas

The antennas you get with most routers and wireless adaptors are of a particular kind, called omnidirectional antennas. This means they give the best average coverage in every direction, which gives them a high level of convenience: you don't have to worry about how they're angled or positioned, because the signal they give out reaches roughly the same distance in every direction regardless of where they're pointing.

We've already discussed how placing a router near to an external wall can cause much of this omnidirectional signal to encompass areas where there's no chance of

your computer actually being located (outdoors, for example). Rather than move your router so that you're closer to the centre of the wireless sphere, you could simply replace the omnidirectional antenna with a high gain or directional antenna.

Most wireless access points and adaptors allow you to replace the antenna they ship with in an easy manner. Simply unscrew it at the base, then screw the new one in its place. By installing a high-gain antenna that focuses the signal in one direction, you can substantially increase the power of your wi-fi signal without having to move your router. It doesn't use any more power than the omnidirectional antennas; rather, it focuses that power on a single bearing to make more efficient use of it.

The gains can be substantial. Just don't get confused if it takes a little trial and error to find the best orientation!

5 Add A Wireless Repeater

If you've ever had to use a signal booster to clear up a weak TV signal, you should be able to grasp what a wireless repeater does. And even if you haven't, the name should provide a fairly big clue!

Wireless repeaters are, essentially, extensions of your access point. By placing one at some point between the adaptor and the wireless point it's connecting to, you can create a sort of bridge between the two, extending the network's effective coverage and increasing speeds and reliability all around. The repeater doesn't do anything fancy to your network; it simply rebroadcasts whatever signals it receives, extending the range with only a slight increase in signal latency as the cost. In theory, once it's up and running you'll never have to touch it again.

When buying a repeater, it's important to make sure that it's capable of working with the type of network you're running. Because Wireless G and Wireless N operate on different frequencies, the repeater for one is unlikely to be compatible with the other. If in doubt, check your existing hardware and software configuration to see what type of network you have.

Better still, if you have a spare router lying around the place, you may be able to convert it to run as a repeater on its own, saving you the expense of buying a new one. Refer to your manual before buying a dedicated repeater.

5

"Wireless repeaters are, essentially, extensions of your access point"

6 Tweak the Signal Power

If you want better network coverage but don't want to buy extra hardware to get it, then you might want to check whether you have a router that supports Xmit functionality. If it has the power, you can improve your network signal for free by manually raising the Xmit value. This refers to the amount of power that a router uses to broadcast its wireless signal, and you can normally increase it by up to 50mW without causing any problems, which will increase the range and reliability of the signal proportionally. It's particularly useful if you're finding that walls or other obstacles are weakening the signal.

It's not without its disadvantages, of course. In much the same way that overclocking a computer shortens its life, the same is true of raising the Xmit power of a router. You risk causing the hardware to overheat, which may expose it to permanent damage, so for that reason we advise caution. Don't

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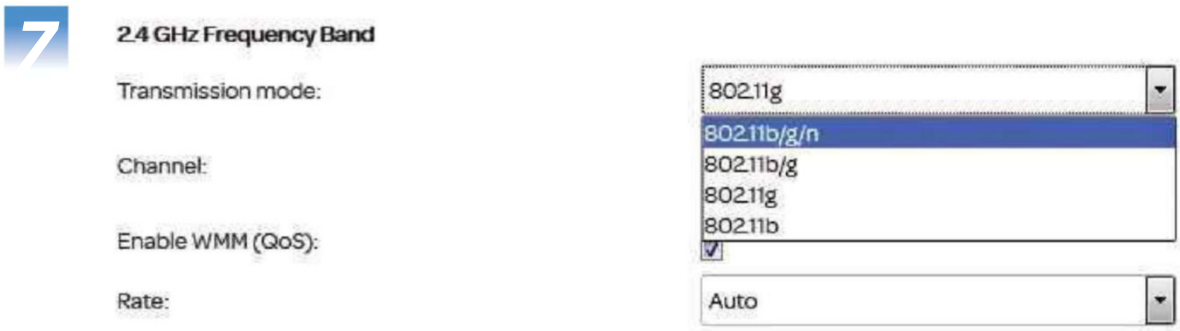

increase the Xmit values unless you're prepared to risk buying a new router.

Don't get too worried about the term 'high power' either. Wi-fi signals are 20 times less intense than mobile phone signals, so even if you crank them up, they're still just a drop in the digital ether!

7 Make Sure You're Using The Fastest Protocols

The backwards compatibility of wireless routers means it's very easy to find yourself using a slower protocol than the best available one. If your access point supports Wireless N but your network adaptor only supports Wireless G, your router will happily allow you to make a slower connection without pointing out that there's a lot of capacity being wasted. Likewise, if you're running a Wireless AC router, it'll have no trouble allowing you to run a Wireless N connection.

The best way to avoid this is to upgrade your hardware whenever you get a new access point, which shouldn't be too regular an occurrence anyway.

Note too, that if you're running a Wireless N network, you might have the choice of either a 2.4GHz connect or a 5GHz connection. Although they use the same protocol, the slight difference in technologies means that they're not quite identical when it comes to performance. 5GHz connections are faster and less prone to interference, but 2.4GHz connections have slightly better range and greater compatibility with older hardware. Choose the one that suits your needs best.

Note that having hardware support for Wireless N doesn't automatically mean you can choose to connect to either type of network. Only dual-band hardware, which is slightly more expensive, gives you the option. If you're using a single-antenna Wireless N device, then you might be confined to either Wireless N (2.4GHz) or Wireless N (5Ghz) – but on the other hand, it's only a cheap upgrade, and one worth considering if you want a speed or reliability boost without spending a lot of money.

Perhaps the greatest benefit of having dual-band hardware, however, is that you can use both frequencies simultaneously, reducing network congestion and giving implicit priority to certain devices. Laptops and desktops might benefit from the faster speeds offered by a 5Ghz connection, while phones and tablets will benefit from the superior range of a 2.4GHz connection. If you have both available to you, there's no reason not to make use of them! **mm**

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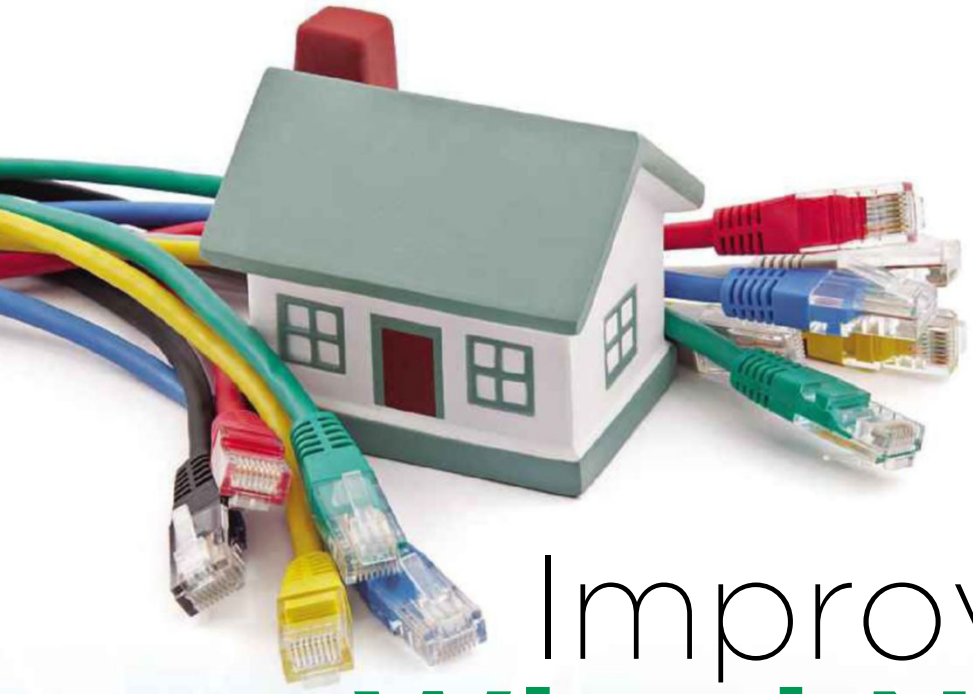


Tips To Improve Your **Wired Network**

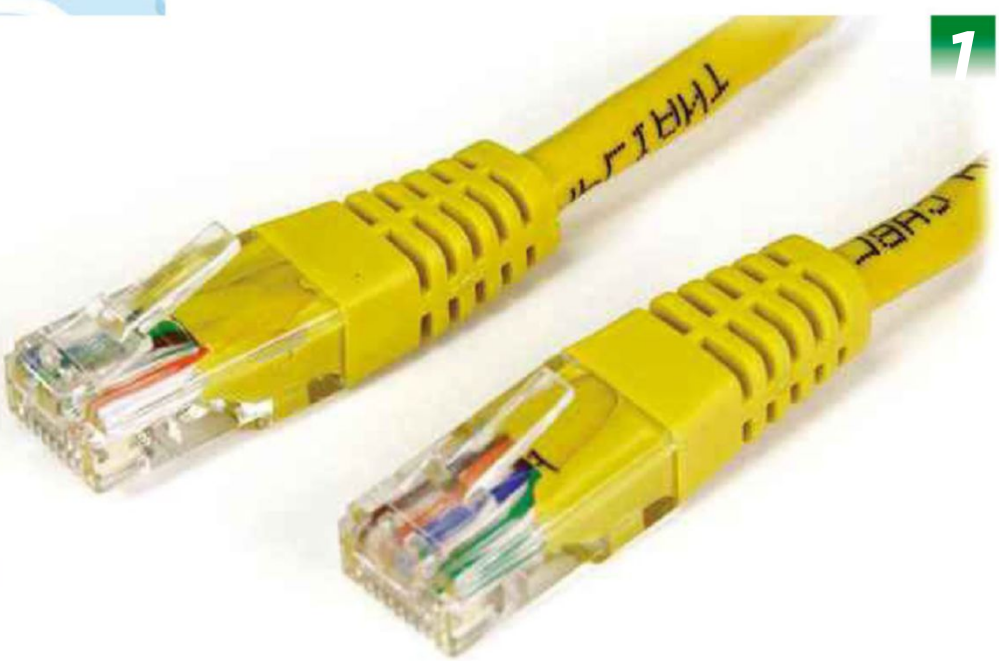
Even a cabled network can have problems, so let's address some of them right here

If improving your wireless network seems difficult, improving a wired network seems nearly impossible. After all, the strange alchemy of wireless communication seems to leave plenty of scope for modification and alteration. How much can you change when all you have to work with is a cable and two sockets?

Well, as it happens, quite a bit. And here are some of the things you can do if you want to improve the way your network performs.

1 Simplify Your Topography With Crossover Cable

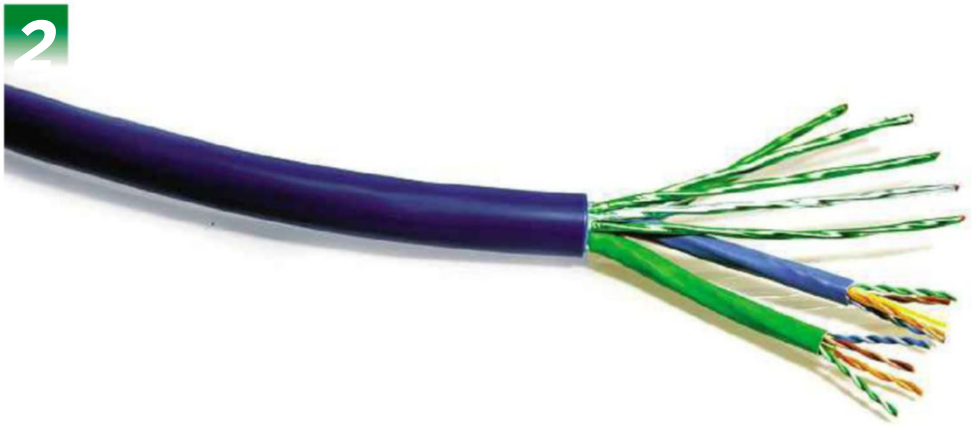
One of the benefits of wireless networks is that there's very little need to worry about physical topography. It's no more difficult to connect two computers that are in the same room than it is to connect two computers that are right next to one another. But that's not true of a wired network, because even if your desktop systems are in the same room, you still have to run a cable from each system to the router and back. This creates a lot of physical redundancy.



However, you can get around it using something called 'crossover' cable. Crossover Ethernet cable allows two network adapters to connect directly to one another – something you can't do with standard 'patch' cable – meaning you can bypass the need to connect to a router or other type of network hub. This allows for fast and direct file transfers, and if one system is connected to a modem, you can also use it to share an internet connection.

This is especially useful if one computer on your network is always on (perhaps because it's a server of some description) and others are close by it. It should be more convenient to use crossover cable and an extra network card to share the internet connection from that machine, rather than run two (or more) cables all the way back to the network hub.

And that isn't the only use for crossover cable. If your hub or router is low on Ethernet ports (say, you have five systems that need to share an internet connection, but your router is only a four-port one), you can use crossover cable to connect a regular PC to the 'uplink' port on a router, which is usually reserved for attaching external modems to routers and switches. Again, standard patch cable won't allow this, but



> **If you're feeling particularly extravagant, you may also want to buy CAT6 cabling**

buy a piece of crossover and you'll effectively gain access to an extra network port. Certainly a cheaper solution than buying a second router if you're only one port short!

2 Make Sure Your Hardware Is Up To Speed

Although Fast Ethernet (100Mbps) is still the most popular form of wired network, many modern routers, network cards and motherboards incorporate support for gigabit Ethernet, which runs ten times faster, at 1000Mbps. If you have any hardware that supports gigabit-speed connections, it's not that expensive to improve the rest of your hardware so you can take advantage of these higher speeds.

But in addition to that, you should also make sure your cabling is properly rated for the high speeds of gigabit Ethernet. There are two main types of Ethernet cable: CAT5 and CAT5e. The former is rated for standard Ethernet and Fast Ethernet connections (10Mbps or 100Mbps respectively) but only the latter can get the full speed out of gigabit Ethernet.

And it's not just for speed freaks either. CAT5e cable also has other advantages, which make it more likely to provide a stable and reliable connection. Improvements over vanilla CAT5 cable means that CAT5e incorporates greater resistance to device interference, reduced 'cross talk' emissions, and improved durability, thanks to better standards for its PVC coating. CAT5e is also backwards compatible with Ethernet and Fast Ethernet, so regardless of what speed network you're running it makes sense to ensure you're using CAT5e – even if that means replacing existing CAT5 cables.

If you're feeling particularly extravagant, you may also want to buy CAT6 cabling. It's arguably more than you need right now, but CAT6 isn't much more expensive than any other kind of network cable and is rated to speeds of 100Gbps. You can't argue with that level of future-proofing!

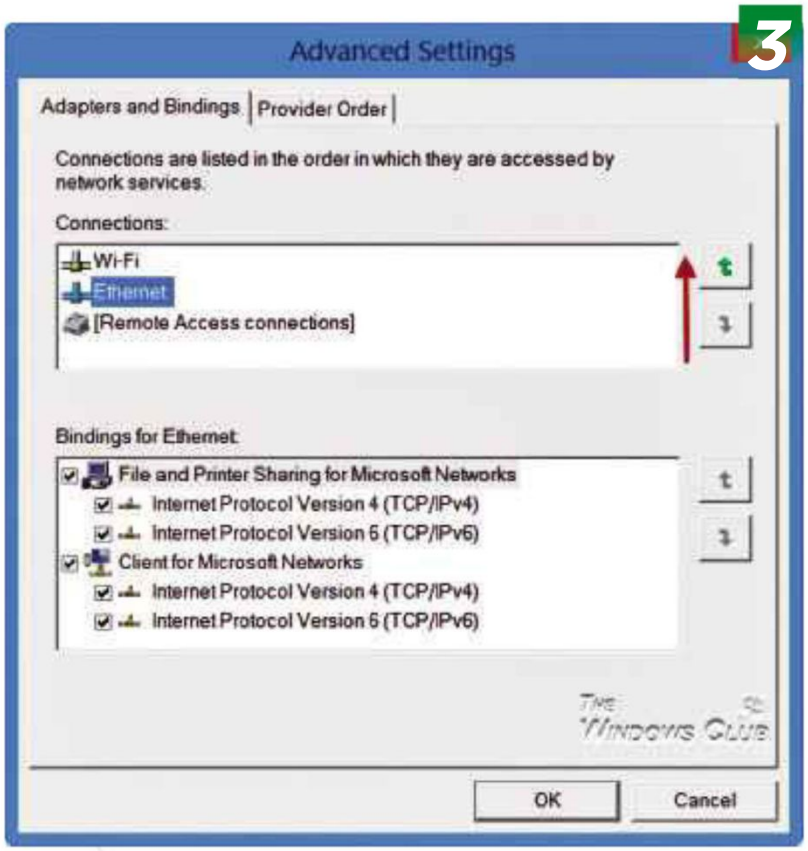
3 Prioritise Your Wired Network

Most wireless access points also have hardware network ports so you can create a wired network as well, so it's not entirely unusual for those who run a wired network at home to have a wireless network as well. It's also not unusual to leave your wireless adaptor enabled, in case you want to take your laptop into another room or out in public.

If you have both a wired and wireless network setup, it goes without saying that the former is likely to offer better speed and reliability – but Windows has a habit of always choosing the wireless network if both are available. We can only speculate as to why, but suffice to say it doesn't make a lot of sense.

Luckily, it's possible to change this behaviour. The easiest way is to change the connection priority of your wired network adaptor by finding the little-used options dialogue that lets you do so.

To find it, open up the 'View network connections' window (type 'view network connections' into the Start menu), then from here select 'Advanced > Advanced Settings' in



the file menu (you may need to press Alt to make the file menu appear). In the Advanced Settings dialogue, you should now be in the Adaptors and Bindings tab. To prioritise your wired network, select the relevant connection (probably just called 'Local Area Connection') and click the green arrows until it's top of the list. Click 'OK' to apply the change, and if all has gone to plan, the wired network will now be prioritised, and you'll never find yourself connected to a slow, potentially unreliable wireless connection again.

4 Minimise Interference And Signal Distance

If you're laying network cable around your home or office, there are numerous electrical items that might interfere with the signal, decreasing speeds and reliability.

Anything that generates a strong electromagnetic field has the potential to be a problem; stereo speakers are particularly obvious culprits, but everything from fluorescent lightbulbs to microwave ovens can have similar effects. Indeed, it you do have to wire your network near a fluorescent light, it's recommended that you run cable lengthways in the same direction as the tube, rather than across it, as this can minimise the interference.

Even hardware designed to handle network traffic can slow down and degrade a signal. It's not a huge problem in home networks, but if you're running a large system with multiple switches and routers, remember to keeps cables as far away from one another as possible to minimise their electrical interaction, and to arrange the network so connections visit as few hubs as possible. The more hubs a signal passes through, the more time it takes to reach its destination.

Network cable is good for transmitting signals over huge distances (without interference, CAT5 can transmit a signal for 285 feet without problems, and CAT6 can transmit for up to 700 feet), so there shouldn't be any need for additional network hardware in the home. Just make sure your cable is the right length!

5 Use Your QoS Settings To Manage Traffic

You may have seen 'QoS' settings in your router, but unless you've specifically investigated you're unlikely to know what it is or what it does. Well, we can tell you. QoS stands for 'Quality of Service', and while it might sound like a fancy name for a customer feedback form, it actually allows you to tweak the priorities of various kinds of traffic. In a practical sense, it means you can make your router do things like treat game data as more important than web data to minimise latency or keep your Skype connection strong even if that means slowing your downloads. Essentially, you force the router to deal with the traffic you want to prioritise first instead of letting it decide.

Some routers come with a selection of predefined QoS settings available for you to choose, meaning you can manually enable and disable them depending on your preference without any further work. Other routers will force you to find the information you need yourself and enter it manually, but don't worry, it's not a particularly difficult thing to do. Normally, you just have to find out what port (or port range) the traffic you want to shape is using (e.g. HTTP traffic is port 80) and assign it a name.

> **"QoS stands for 'Quality of Service"**

In some cases you can also add the MAC address of your computer, smartphone or other network adapter to ensure that your system gets additional priority over the rest of the network. It's not foolproof, but with a bit of tweaking you can normally improve performance on busy connections without too much effort required. Note that QoS settings don't change or limit the amount of data that's actually sent – it simply tells your router which data to deal with first.

As an addendum to this, take care when looking for QoS settings. Many router brands use proprietary names for this service, designed to try to make its practical applications more obvious. If you see a setting such as 'traffic prioritisation' (or similar), then

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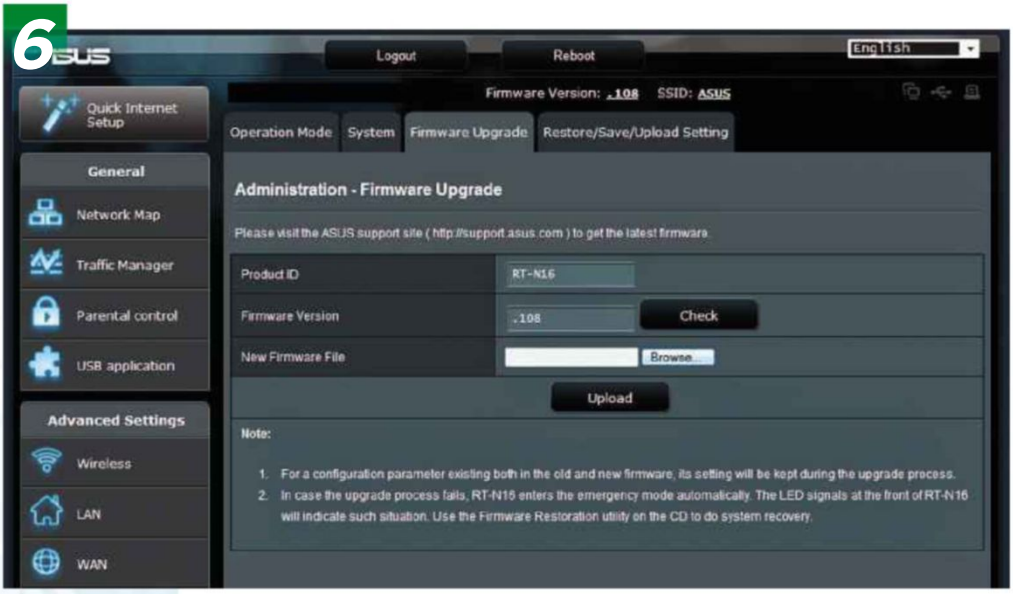

this is likely to be a standard QoS service given a different name.

6 Upgrade Your Firmware

Installing new firmware in a router can be an irritating process, not least because it might wipe out custom settings you've built up over years of use. But new firmware can add features, iron out bugs and improve compatibility, all of which can contribute to a more robust network signal. In some ways, upgrading the firmware makes old routers feel like new.

Firmware downloads are normally available from the manufacturer's website, and updating the router is a fairly simple process, which can be accomplished from the system's administration back-end.

If you're feeling particularly adventurous, you could try replacing your router's firmware with a free, open-source alternative called DD-WRT. Available from **www.dd-wrt.com**, the firmware adds a number of features and greater controls not found in most router software. It's not for novice users – improper application could turn your router into little more than a decorative brick – but if you think you have an old router around that might benefit from the more advanced software, it could prove a fun experiment!

7 Consider HomePlug Networking

Although wired networks offer great speed and reliability, the unavoidable need to run cable around your house is so impractical that it normally puts people off. An alternative to using standard Ethernet cabling is to invest in a HomePlug system.

HomePlug is a relatively new networking technology, which uses your home's existing electrical infrastructure to transfer a data signal, using filtered plugs to filter the data in and out at either end. It avoids hard-to-diagnose problems with wireless interference and connectivity, and the latest standards are even faster than Fast Ethernet (HomePlug AV2 can reach 600Mbps under optimal conditions).

The big and most clear advantage to HomePlug is that it allows you to establish a wired home network without the use of additional cabling, since it uses an infrastructure already available in every home. Although the term applies to any system that uses electrical wiring to transmit data, there are a number of different standards under the umbrella, so it's important to choose the right one for your purposes – especially because not every standard is compatible with the others.

As the name suggests, HomePlug networking isn't designed to be used for large networks. The range of a HomePlug signal is short, which helps to stop it from travelling to any other houses or buildings, but it also means that if you're in a particularly large building you may run out of range quite quickly.

Similarly, since the signals are transmitted over all lines, rather than a single cable (this is how the signal 'knows' where to go – it just goes everywhere!), it's worth noting that the more devices you add, the more likely you are to overstretch the capacity of the infrastructure. It's not a huge problem if you're building a domestic network of maybe four to six devices, but go beyond that and you'll quickly notice speed drops and connection instability.

Finally, be aware that larger buildings may use multi-phase power or isolated power infrastructure to reduce interference. For two HomePlug networking devices to communicate, they need to be on the same circuit – something that isn't necessarily the case, even within a single building, if you're in a larger environment. Don't assume that HomePlug will work just because two devices can both get power under the same roof! **mm**

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ROUTERS BUYERS GUIDE

Which network hardware deserves a place in your home?

Whether you're setting up a network from scratch or upgrading your existing one, the process can involve some serious hardware costs. Chief among these is the purchase of a new router, which often acts as a wireless access point, modem and network switch all at once.

The average modern household probably contains several devices that can access the internet. Everything from mobile phones to games consoles and even DVD players can access the internet to expand their capabilities, so a good router – one capable of sharing your internet connection between multiple devices – is practically a household necessity.

But what should a good router do? And what features should you look for when buying one? In this guide, we'll examine a range of devices to help you answer those questions and more.

Wired-only Routers

As great as wireless routers are, not everyone has (or wants) a wireless network. If you want to set up a small network that doesn't have any wireless devices or extend an existing network for a small amount of money, a non-wireless router is often a cheap and convenient way to do that. Any four-port router is enough to connect up the computers of most home networks, and whether it has a modem built in or connected via an uplink port, it'll happily share an internet connection throughout your home.

Best Budget Model: TP-Link TL-R460 (£12)

Of all the routers you might find on the market, this is probably the cheapest. It comes from the master of cheap network hardware, TP-Link, and if your preferred approach is to get the most basic performance for as little money as possible, then you're going to be hearing a lot about this firm. In this case, it's produced the four-port TL-R460 router, which incorporates a DSL modem and four Fast Ethernet ports offering network speeds of up to 100Mbps. Extra features include parental controls, DDNS support, VPN pass-through, as well as the standard router functions like DMZ, DHCP and a firewall – none of which you can guarantee at this price. Indeed, even having four network ports is a luxury.

As with much of TP-Link's hardware, it's basic and not very well crafted, but it does the job and has enough features to make it functional. It's ideal as a stop-gap solution, and while we wouldn't want to run a large network using nothing but this, there's no reason a small home network wouldn't run fine. It compares extremely favourably to the similarly priced competition, much of which can only muster a single LAN port. That said, its only real stand-out quality is the almost impossibly low price, but if you're looking to spend as little as possible, we can't find any good reason not to buy it.

Best Mid-price Model: Netgear DG834 (£49)

The DG834G has shown incredible staying power over the years, enduring for over a decade with only

minor product revisions. It combines an ADSL2+ modem, a router and a four-port Fast Ethernet switch into a single device, and although there's not a huge amount to go on, feature-wise, outside the normal range, it is impressively consistent in its performance.

Specifically, it doesn't noticeably struggle if there are multiple heavy connections, and is unlikely to hang or spontaneously reboot like cheap models will if you put them under stress. It's also accessible and simple to use, with easy-to-configure settings, good security features and a comprehensive set of networking abilities.

As good as its performance is, it's hard to recommend when it's so much more expensive than the alternatives. For this amount of money, you could buy several cheaper routers and share the load between them or even a slightly cheaper wireless router with four network ports. It's undeniably a high-quality piece of hardware, but at a certain point you have to ask whether that's something worth paying extra for. For home and casual networks, it's simply too expensive to be worth buying.

That said, if you're building an office network and can't afford to risk a reboot during times of high load, this is exactly the hardware you need, and we suspect that's what keeps it in production even all these years on.

Best High-end Model: TP-Link SafeStream TL-R600VPN (£63)

As if to show up Netgear's pride and joy as being a little overpriced and outdated, TP-Link's TL-R600VPN is the cheapest gigabit router on the market by some distance. Like all TP-Link products, it's typified by a wonky back-end and dodgy performance under heavy loads, but it's almost half the price of any alternative, and there's an added bonus: it supports up to 20 IPsec VPNs, making it a great device if you're a small business (or even gamer) expecting to deal with incoming telecommuters.

It's clearly business focused: both its LAN and WAN ports are full gigabit Ethernet, and there's an integrated firewall as well as a much less common built-in surge protector. The quick-start web interface is fairly simple to get through, helping you to set up connection settings and security features, but it's hard to customise a lot of the settings and not very powerful as a result. It's mostly a case of turning features on or off.

Still, if you want to spend more than £50 on a wired-only router, it makes a far more convincing case than the Netgear DG834, even with TP-Link's self-consciously budget name attached. It might not read the full gigabit speeds on offer if you have a full complement of users, but even with that caveat it's by some distance the fastest wired router available at its price.

Wireless N Router (Single Band)

Although it's technically possible to buy a Wireless G router, there's no particular reason to do so. Wireless N routers are backwards compatible with Wireless G, so even if you don't want to upgrade the rest of your hardware, it's worth giving yourself the ability to take advantage of Wireless N where it's available.

Wireless N routers are available in multiple flavours, however, and that's why we've split their section in half. First, we'll look at the cheaper, single-band routers. A single-band Wireless N router will probably be the cheapest option, and while it won't give you the ability to take advantage of the slightly faster (but lower-ranged) 5GHz band, you'll still be able to get speeds of up to 150Mbps out of even the most basic hardware.

Best Budget Model: Zoom 5792 (£25)

Finding a budget Wireless N model isn't at all difficult. Their low price, relatively fast speeds and ease of production means that they're a

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good deal for everyone involved, especially if you're just a casual user who doesn't want a lot of high-end features. And while there are cheaper wireless routers around than the Zoom 5792, in all honesty there are none that we could recommend that you actually bought. Even some slightly more expensive ones don't hold up as well as this.

Easily the best low-cost single-band Wireless N router around, the Zoom 5792 has a built-in 100Mbps four-port switch and an ADSL modem for fully integrated network routing, so it's a one-stop solution. It's unashamedly low-cost and, as usual, that means you can forget seeing any particular abundance of features and options, but what it does, it does well. It's designed to be switched on and forgotten about, and at least you can be sure it'll keep up its end of the bargain, which isn't true of all routers. Simply designed and reasonably attractive, it arguably looks more expensive than it is, and it definitely performs above its price.

There's one possible thing that might put you off, and that's the ADSL support. It only claims ADSL speeds of up to 27Mbps, so if your connection is in any way faster than that, you might need a different piece of hardware to reach the full potential. But for £25, you probably didn't expect miracles anyway.

Best Mid-price Model:
Belkin Surf N150 (£32)

Unfortunately for Zoom, its brand isn't a particularly popular one in the UK. If you'd rather go with a name that you've heard of – and, for that matter, one that has a good reputation – then Belkin makes its own single-band Wireless N router called the Belkin Surf N150.

Even though it's more expensive than many entry-level Wireless N routers, it's still undeniably within the 'cheap and cheerful' range. You do pay a little extra for the brand name, but it's still hard to argue with what you get for the money, and hopefully the increased reliability and build quality will offset that. Inside you'll find a four-port switch with built-in ADSL2 modem and Wireless N150 access point.

As the name suggests, it's primarily designed as a low-throughout web-surfing router, but that doesn't stop it from having extra features not found in other hardware, including a Belkin-exclusive MultiBeam feature, which minimises dead spots, and preset security settings to ensure that your network is safe.

If you're hoping to get a basic Wireless N router or even want to replace a wireless G one, this is the model we'd recommend you start with. Excellent value, simple setup and well pitched at low-end users, it's perfect for anyone who's running a small network and doesn't want to spend too much time with the hardware.

Best High-end Model:
Netgear DGN1000 (£45)

Netgear does nothing in its literature to hide the fact that the DGN1000 is a direct successor to the supremely popular Netgear DG834G, a wireless G device, which was one of the country's most popular routers for a variety of very good reasons. In that sense, the DGN1000 is a good choice – familiar, but undeniably superior, with faster speeds and better coverage than Wireless G routers could offer. Of course, it's getting a little long in the tooth now that Wireless AC is firmly established, which begs the question of whether it's a good idea to buy a single-band Wireless N router at all – but that's for you to decide. If you do want one, this is the best.

As well as the standard Wireless N speed of 150Mbps, you get Netgear's standard package of extras, including live parental controls, an auto-configuration 'N-Connect' button and more besides. These are then bundled up with Netgear's rock-solid reliability and performance and, naturally, a four-port Fast Ethernet switch and ADSL modem built in.

The price might be considerably higher than a lot of other single-band

modems, but the polish can be seen in some of the less common features the DGN1000 offers: green features such as hardware on/off switch and a wi-fi enable/disable switch, an energy Star-compliant power adapter and built-in support for OpenDNS. It's not necessarily any faster than cheaper models, but it's so much more convenient that it's worth paying extra for – assuming, of course, that there's a good reason you're not buying a dual-band model.

Wireless N Router (Dual Band)

Although a single-band router is enough for light use, a dual-band Wireless N router can offer network owners greater speed, compatibility and coverage compared to its single-band siblings. Performance expectations start at 300Mbps, but the more you spend the better chance there is of clocking up throughput towards 600Mbps, depending on the technology in use.

Dual-band routers are a great choice if your household uses lots of wireless devices simultaneously or if you simply want to make sure you get the best network speeds possible. You spend a little more, but it's nothing compared to the convenience they offer!

Best Budget Model: TP-Link TD-W8968 (£35)

In what may be a recurring theme, the best budget dual-band router is, unsurprisingly, one made and manufactured by TP-Link. Say what you like about its product design, back-end software and reliability under intensive use; at least it's staked its claim on an identifiable section of the market and made it work for it. Netgear's routers might be great, but they're also undeniably expensive. TP-Link's hardware is the complete opposite: affordably priced and often lacking a little polish as a result.

Luckily, that's not the case here. The TD-W8968 Wireless N300 router presents strong competition. With an easy-to-follow setup wizard, dual-antenna design and a fairly stylish appearance, it's one of TP-Link's better products by some distance. It's not perfect; there aren't any single-button setup tools (no WPS, for example), and you have to do the initial configuration over a wired connection, which is inconvenient to say the least, but if you want to save the money, these are minor issues, easily circumvented with a little (free) time.

Best Mid-price Model: Asus RT-N56U (£65)

In recent years, Asus has become one of the computing industry's best brands, offering a wide range of products with market-topping performance at reasonable prices. And the Asus RT-N56U continues that trend.

This is a router that has been redesigned from the ground up to throw off the shackles of traditional, box-and-aerial form factor and come up with something that doesn't just look good; it looks almost sculptural. The wireless is multi-channel, but there's no way to tell by looking, because the antennas are discreetly embedded within the device itself: two aerials for 2.4GHz and three for 5GHz, which allows support for Wireless N up to 300Mbps depending on your chosen mode.

It's not shy on extras either: there are also four gigabit LAN ports, a cable-ready WAN port and the usual selection of security features and configuration options available through an easy-to-use web interface. The WPS fast-setup button means you can create a secure connection to a compatible OS (Windows 7, for example) without the need to type in tedious WPA keys.

The best feature, however, is the USB compatibility, which allows you to attach storage (so the router can double as a media streaming centre), 3G dongles (to share mobile internet connections), printers and many other devices. There's even a BitTorrent client built in. It is, in many ways, the first

router we've looked at that's designed for modern home needs, rather than generic networking. Not just a good router – one of the best.

Best High-end Model: Netgear DGND3700 (£100)

If you're going to go for a dual-band router, you might as well do it properly. The Netgear DGND3700 offers true dual-band performance, meaning 300Mbps simultaneously on both the 2.4GHz and 5GHz channels – something you won't find on any cheaper device, as far as we could see. That means a maximum potential speed of up to 600Mbps, which is perfect for houses that make heavy use of their network for things like media sharing and streaming or places where there might be a large number of simultaneous users, such as small offices.

You also get a huge number of extra features in the package: four gigabit Ethernet ports, two USB ports ready for detachable storage and mobile dongles, multiple SSIDs (including a built-in guest network), single-button connections, live parental controls and even a broadband usage metre. We can't think of a feature we'd want that isn't in this router, and although it's not quite as good value as the Asus RT-56U, it does improve on it in every other regard. So as long as you have the money to spare, it's worth every penny.

Wireless AC Router

If you haven't installed a Wireless N network in your home yet, you might be troubled to learn that the successor, Wireless AC, is growing in popularity by the week. Support for Wireless AC has already been added to many successful product lines, from Apple smartphones and tablets to high-end Ultrabooks and gaming PCs. Wireless AC speeds start at 433Mbps and, in practical terms, top out at a rather satisfyingly fast 1.7Gbps. Tempting, isn't it?

Of course, a Wireless AC network starts with a Wireless AC router, and if that's what you want, the unfortunate reality is that you're going to have to pay quite a lot to get it. On the other hand, it's guaranteed future-proof, and if you buy the right hardware, you might find that it's fast and reliable enough to run your network for years to come.

Best Budget Model: TP-Link Archer C20i (£33)

Most of the routers we've looked at contain an ADSL modem, since that's overwhelmingly the way most people in the UK get their broadband. However, if you already have a modem – or you're not averse to running an additional router – you can get a Wireless AC-enabled access point for as little as £35.

Once again, you have to look to TP-Link for this bargain. The Archer C20i isn't just its first sub-£40 Wireless AC750 router – it's pretty much the first one ever. As well as supporting gigabit Ethernet, it has dual-band 802.11ac at speeds up to 750Mbps. While you don't get some of the high-end features seen in the older (and twice as expensive) Archer C7, you do get a USB port that allows you to share storage and printers over the network through built-in software. It's an incredibly useful feature and a genuine rarity on entry-level wireless routers.

Although TP-Link's hardware is sometimes a bit too basic and flimsy feeling, the C20i is one of its more solid releases. The upright form factor hides three internal antennas for stable, omnidirectional connectivity, and the software is made to meet modern needs. A guest network allows you to easily share your connection with visitors, while built-in parental controls allow you to restrict access and bandwidth by IP. At this price, it's hard to overlook it.

Best Mid-price Model: Belkin Wireless AC1200 (£113)

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and the ability to take advantage of even faster multiplexed Wireless AC transmissions, the Belkin AC1200 is worth checking out. It's expensive compared to most other routers, but compared to other Wireless AC routers it's surprisingly reasonable.

If nothing else it's dropped almost £100 in the last year alone, so that should give you an idea about the state of pricing in the Wireless AC router market.

Most of the feature-set is fairly standard, with four gigabit Ethernet ports, two USB 3.0 ports for detachable storage and some one-touch configuration buttons, but again you're getting the reliability and quality of the Belkin name. If anything's likely to be a problem, it's that the AC1200 is quite old as Wireless AC routers go, and that means it's very much a first try at getting one right. Newer and more expensive Belkins offer performance that, while not necessarily faster, is certainly less variable. For some people, that's not going to make the price easier to swallow, but it's hard to get better for less. If you're not willing to spend £100 or more on mid-level equipment, Wireless AC might not be for you.

Best High-end Model: Asus RT-AC87U (£240)

If we had unlimited money to spend on a consumer router, there's a very good chance this would be the one we'd go for. The Asus RT-AC87U is, by all accounts, about as fast as it gets. Its multi-band communication speeds allow it to reach a theoretical maximum of 2300Mbps, which is enough for smooth 4K and ultra-HD video playback over a network – ideal if you have a 4K TV that needs media server access.

It's a cable router, largely because ADSL routers can't reach high enough speeds to make it worth having this kind of network anyway, but the uplink port and gigabit Ethernet sockets mean you can get it working on an ADSL connection if you want. It has both USB 2.0 and USB 3.0 expansion port, capable of sharing storage, mobile internet and printers, and its back-end is fast, modern and super-easy to use – a world away from the generic web-based interfaces most routers apologetically serve up.

As if that wasn't enough, it's got more features than you could shake a stick at. It supports no less than six guest networks, can be run as a bridge or repeater and comes with free access to a variety of Asus services, including cloud services and anti-virus protection. It is, quite simply, the Rolls Royce of router hardware, and if it seems expensive, that's only because it's got everything. At least you know that if you spend the money, you'll never have to buy another router again.

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Network Adaptors & Accessories Buyers Guide

It's not just a new router that can improve your network...

Whether you're setting up a new wireless network from scratch or upgrading your existing one, the process of buying new hardware can involve a lot of searching and some serious hardware expenses. Like any upgrade, you probably think you can do it the simple, cheap way or you can do it the impressive, expensive way.

But does it have to be like that? To help try to make your cheap networks impressive and your impressive networks cheap, we've put together this guide to the best and most interesting models you can buy for all sorts of networking accessories. If it connects to your router, it's probably on our list, and with our help you should be able to get the most out of your network, whatever you want it to do and however much you want to spend on it.

Wireless Adaptors

Almost all modern motherboards incorporate some form of Ethernet port, but wireless connectivity is still fairly rare and largely confined to the most expensive high-end motherboards. That leaves you with two options for wireless connectivity: an external USB wireless adaptor or an internal PCI wireless adaptor.

Deciding which to get depends on your needs and preferences. By necessity, PCI adaptors are harder to install, and they're often a little more expensive, but the trade-off is that they don't slow your system down. PCI network cards incorporate their own processing hardware which, in USB adaptors, gets farmed out to your main CPU. If every cycle matters to you, then a PCI network card is the way to go.

Conversely, USB wireless adaptors might place a drain on your system, but they're far more versatile in the type and number of systems they can be used with. Simply slip it in your pocket and it'll travel with you wherever you want it to. The price and simplicity of installation is what usually attracts people to USB adaptors, and those qualities are hard to argue with.

Whichever you select, the range of options is huge and far bigger than can be fully contained in a pair of recommendations. But that's not going to stop us trying. At the very least, we can give you a starting point for making your own selections.

Budget PCI Wireless Adaptor

D-Link DWA-525 (£9)

Just because USB adaptors are generally cheaper, it doesn't mean you don't have any choice when it comes to low-cost PCI adaptors. Far from it, in fact. There are plenty of sub-£15 cards around, and some of them aren't even made by budget king TP-Link. As proof, here's an excellent single-band Wireless N150 card which is only 79p more expensive than TP-Link's equivalent, and better in every other regard.

The single antenna reflects its 2.4GHz-only capabilities, but it's

directional and compatible with Wireless G and AC networks, if not at full speed in the latter case. The bundled software allows for WPS-protected connection, and there's also a low-profile bracket in the box for use in slim systems.

About the only bad thing you can say about this card is that it doesn't come with its own Ethernet connection port, but then it's a safe bet that your PC already has one anyway. It's not the most thrilling piece of hardware, but performance is solid, and it gets the job done. If nothing else, it's potentially three times faster than a Wireless G connection, so that's reason enough to upgrade. At £9, it's so cheap it's hard to find a reason not to go for it even if you weren't planning on upgrading your card.

High-end PCI Wireless Adaptor

Asus PCE-AC68 (£63)

If the previous card was too cheap to ignore, the Asus PCE-AC68 might be the opposite. It's so expensive you'll have a hard time trying to justify why you need it. But make no mistake, this is a wireless adaptor that qualifies as all-singing, all-dancing, and the feature list could make you practically beg to pay for it.

Don't believe us? Stop when you get to something you don't want. It's a dual-band Wireless AC adaptor that can achieve speeds of up to 1900Mbps, assuming your network is fast enough to handle that. The Broadcom fifth-gen AC chipset has its own heatsink to keep performance smooth and uninterrupted even in systems that get a bit hot. A flexible, triple-antenna aerial comes mounted on a cord with a magnetised stand so you can make sure you're getting the best signal and that it stays in place, and all three antennas can be removed and replaced at your preference. And, of course, it comes with a low-profile bracket if your system requires one.

In short, there's nothing you could want out of a network card that this one doesn't have, with the possible exception of a gigabit Ethernet port. But let's face it, when you can get faster speeds wirelessly, it's far from necessary to have wired support as well. It costs a lot, but seriously, it's worth it.

Budget USB Wireless Adaptor

Asus USB-N10 Nano (£6)

The Asus USB-N10 wireless adaptor is so small that you could potentially forget it exists, and that's what makes it so good. Whether you're adding it to a laptop or desktop system, it's discreet, stable and completely unlikely to get knocked or yanked out of the socket like many large, cumbersome USB adaptors are.

As if the lack of any visible antenna didn't clue you in, this is single-band N150 hardware, and the fact that it mostly doesn't seem to exist is proof that it does most of the work in software. That said,

the software is good, achieving strong speeds and coming with some interesting features, such as the Software Access Point function, which allows you to securely share your internet connection with other users. An auto-off function also makes sure you don't waste power searching for a wi-fi signal unless the system is in use, which is ideal for situations where battery conservation is a priority.

As USB adaptors go, it simply couldn't be more compact. If anything, that's its biggest flaw. If you put this in your pocket or drop it on the floor, there's a good chance if might disappear forever, which is a problem you don't have with larger dongles. For £6, you'd expect there to be some catch, but that's just pessimism talking. If you want a decent Wireless N connection for the lowest price possible, then frankly it over-delivers.

High-end USB Wireless Adaptor

Asus USB-AC53 (£50)

Even when you're looking for a USB adaptor, there's no shying away from the high cost of Wireless AC hardware. However, the fact that you can get the Asus USB-AC53 for under £50 is a pleasant surprise, because it means you can get your network hardware from a respected manufacturer, which implies a level of longevity. After all, if you spend £50 on a wireless adaptor, you want it to last.

The AC53 is dual-band, offering combined speeds up to 1200Mbps. The internal patch antennas give you wide coverage, while Asus's NetClip software helps you locate the optimum positioning. Unlike some USB network adaptors, this one comes with a cable-integrated cradle so you don't need to have it sticking inconveniently out of a USB port, and can position it independently of your system. There's also a WPS instant connect button.

The only thing we can imagine criticising it on is that it's quite large, especially compared to the likes of the N150 Nano. While the cradle is innovative, it does add yet more bulk to an already large piece of hardware. Still, it looks great, connects at fantastically high speeds, and if you don't want to crack open your PC and install an internal adaptor, there's no better choice than this one.

Wireless Bridge

Not every piece of hardware with network capabilities has a wireless adaptor built in. Smart TVs, set-top boxes, games consoles, DVD players and other home electronics might have online capabilities but demand a hardware network connection to use it. Rather than buy an expensive, proprietary wireless adaptor or run inconvenient cables throughout your house, you can buy a wireless bridge.

Technically speaking, a bridge is a device that connects two networks, allowing devices on one hub to communicate with devices on another. Wireless bridges do this using a wireless connection. Although bridges look a lot like a standard router or switch, the important distinction is that a bridge connects to another wireless access point. It may or may not provide its own, but primarily it's there to do the job that would otherwise be accomplished by one or more long cables running to the router – essentially 'bridging' the gap between your main network and the secondary network created by the devices attached to the bridge.

Budget Wireless Bridge

Edimax CV-7428NS (£15)

It's possible to find cheaper bridges, but in most cases anything that costs less than the Edimax CV-7428NS will either be a one-port device, support Wireless G connections only or be so shoddily made that it doesn't really work anyway. At most, you'll save £3-5 buying a cheaper unit, which is so little that it hardly seems worth shouldering the inconvenience it'll bring.

By comparison, the Edimax CV-7428NS is a very convenient piece of hardware. Its five Fast Ethernet ports allow you to connect five networked devices, which can then use the bridge to attach to any 2.4GHz wireless network, – so Wireless B, G and N, which includes the 2.4GHz channel of a wireless AC network. The Wireless N connection offered is dual-speed (so up to 300Mbps), meaning if you have Wireless G hardware with a Fast Ethernet port, you can effectively use it to upgrade the device's connection to 100Mbps. Setup is simple enough: it includes a WPS button (something else that's often missing from cheaper hardware), so all you have to do is pair it with your preferred network and plug the devices in. If all goes well, you'll never need to touch it again.

High-end Wireless Bridge

TRENDnet TEW-800MB (£75)

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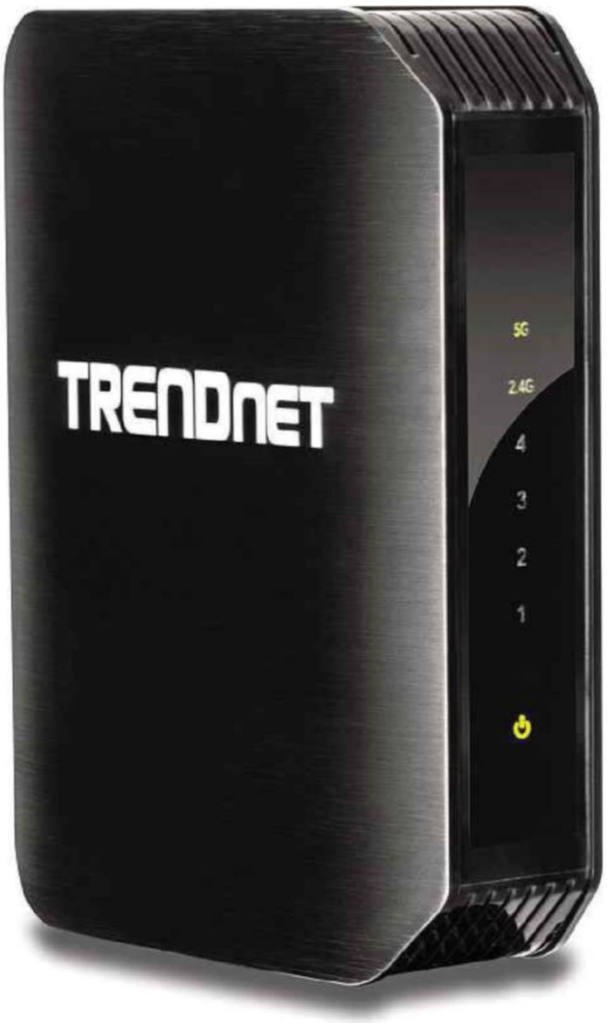
lot of very cheap ones, and not very many mid-priced ones, and then suddenly a lot of expensive ones again. That's why there's a £60 difference between the Edimax CV-7428NS and this.

The leap in price might be near-colossal in scale, but there's a good reason for that – the TRENDnet TEW-800MB is a Wireless AC-enabled bridge capable of providing speeds of up to 1200Mbps if connected to a Wireless AC access point. This makes it ideal for situations where you might be attempting to stream high-definition media to a smart TV or other set-top box. It supports up to four devices on its gigabit Ethernet ports, meaning even multiple HD streams are supported.

Although the speed improvements are what you're paying extra for, you still get plenty of convenient features, such as one-touch WPS connections, encryption support and backwards compatibility for all network types. At this price it's probably too expensive to recommend unless you're likely to stream HD video – not least because the price of Wireless AC everything will be dropping a lot in the coming year – but if you do need a Wireless AC bridge, then this is the one to go for.



Wireless Repeater

Sometimes called a wi-fi range extender, a wireless repeater is used to boost the range of a wi-fi network. The speed and reliability of wireless signals can drop off quite fast once you get a certain distance away from a router, so if you want to retain coverage at the far end of your house or even outside it, a wireless repeater will do the job.

If you've ever had to use a signal booster to clear up a weak TV signal, you should be able to grasp what a wireless repeater does. By accepting and then rebroadcasting a wireless signal, they essentially become invisible extensions of your existing access point. The only practical cost, aside from the power used to run the repeater, is a tiny increase in signal latency.

Before you buy a repeater, it's worth checking your existing hardware. Some routers can be modified to function in repeater mode, so if you have an old one kicking around, you might not need to buy a stand-alone repeater. A more low-tech solution is to simply run cables from your router to the area you wish to reach, but that assumes a lot about the situation – not least that the device you want to connect to has wired network capabilities at all.

Budget Wireless Repeater

Netgear WN3000RP (£35)

The Netgear WN3000RP is a universal wi-fi range extender, which can be used to increase the reliability of wireless networks using any standard up to and including Wireless N. At £35, you'd expect at least that level of coverage; it is, after all, almost as expensive as buying a second router!

To be fair, the WN3000RP makes a fairly convincing case as to why you shouldn't just do that instead. Setup is incredibly simple: you only have to plug it in and hit the WPS button (for Wireless N networks, at least), and it'll immediately get to work. The fact that it's a universal extender means it can be transported, shared and reused without any reconfiguration or adaptation, and it's much smaller than a second router as well!

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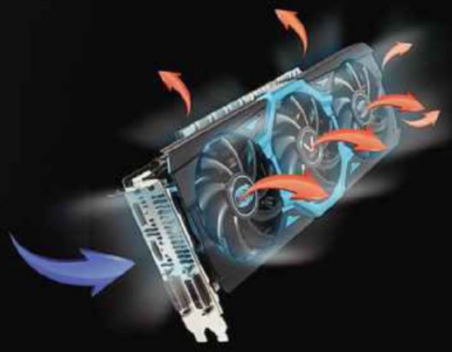

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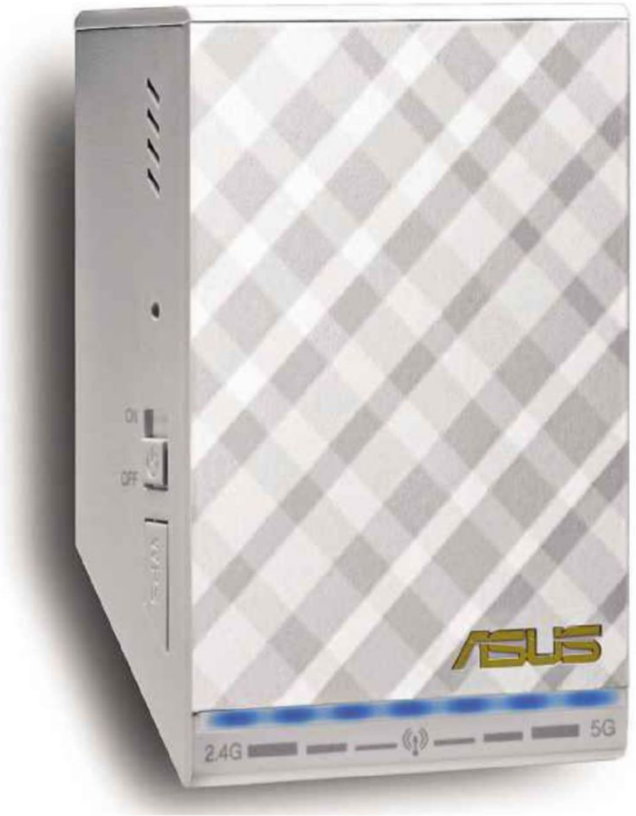
It's not a completely perfect device. As there's no signal strength indicator, you'll have to guess where to place it to get the best performance, and if you're using it on Wireless G or earlier standards, you'll have to go through a slightly more laboured setup process. All of this would be harder to forgive if it wasn't such good value, but ultimately it's not too fiddly even under sub-optimal conditions, and performs well regardless of circumstance. For those reasons alone, it's worth recommending.

High-end Repeater
Asus RP-AC52 (£60)

As with most types of wireless accessory, if you want Wireless AC support, you have to be prepared to accept a significant jump in pricing. The Asus RP-AC52 is a repeater with Wireless AC support for speeds of up to 750Mbps, which is enough to cover the needs of almost any home user.

The RP-AC52 has full dual-band support, so it's compatible with any 2.4Ghz and 5GHz standard, and its variety of on-device indicators eliminate the guesswork involved in making sure it has a strong signal to repeat. A secondary access point mode allows you to connect it to any wired LAN (for example, a library or hotel's access point) and then create a personal wi-fi hotspot for devices that don't have an Ethernet connection.

And as a bonus, you get some of Asus's proprietary technologies. The Asus AiPlayer allows you to plug speakers into the repeater and then stream audio from any connected device, meaning you can play music from your phone without having to tie it to the speakers with a cable, and even access internet radio using the repeater's web interface. There's even a powerful LED on the back, which turns it into a night-light! As repeaters go, it's rammed with gimmicks, but if you want a repeater that stands out from the crowd, we have no better recommendations.



HomePlug Adaptors

HomePlug networking hardware uses a filtered plug to allow your home's internal power cables to transmit a network signal, giving you a potential alternative to wireless bridges and repeaters. It avoids hard-to-diagnose problems with wireless interference and connectivity, and the latest standards can offer faster speeds than Fast Ethernet can (HomePlug AV2 reaches 500Mbps).

HomePlug works over shorter distances and isn't much use in offices, where power systems are more likely to be isolated from one another. They also work well in situations where you only have one piece of hardware to connect – the majority of HomePlug devices have a single Ethernet port at either end.

Still, it's a convenient way to add a wired network connection anywhere that there's a plug socket free, and in many ways it's an order of simplicity easier to set up than a bridge. It's also one of the few alternatives you have if you're running a wired, rather than a wireless network.

Although speeds can be vastly lower than those quoted, due to multiple physical factors (interference, aging cables, potentially poor materials or installation), the technology is generally reliable. If all goes well, HomePlug hardware is easier to set up than any wireless network and requires less installation knowledge than conventional wired – it's almost literally 'plug and play'. Ultimately, these are the qualities that attract people to it rather than its other strengths.

Budget HomePlug Kit
TP-Link TL-PA411KIT (£25)

You need at least two HomePlug adaptors to make it usable, which is why we're looking at pairs rather

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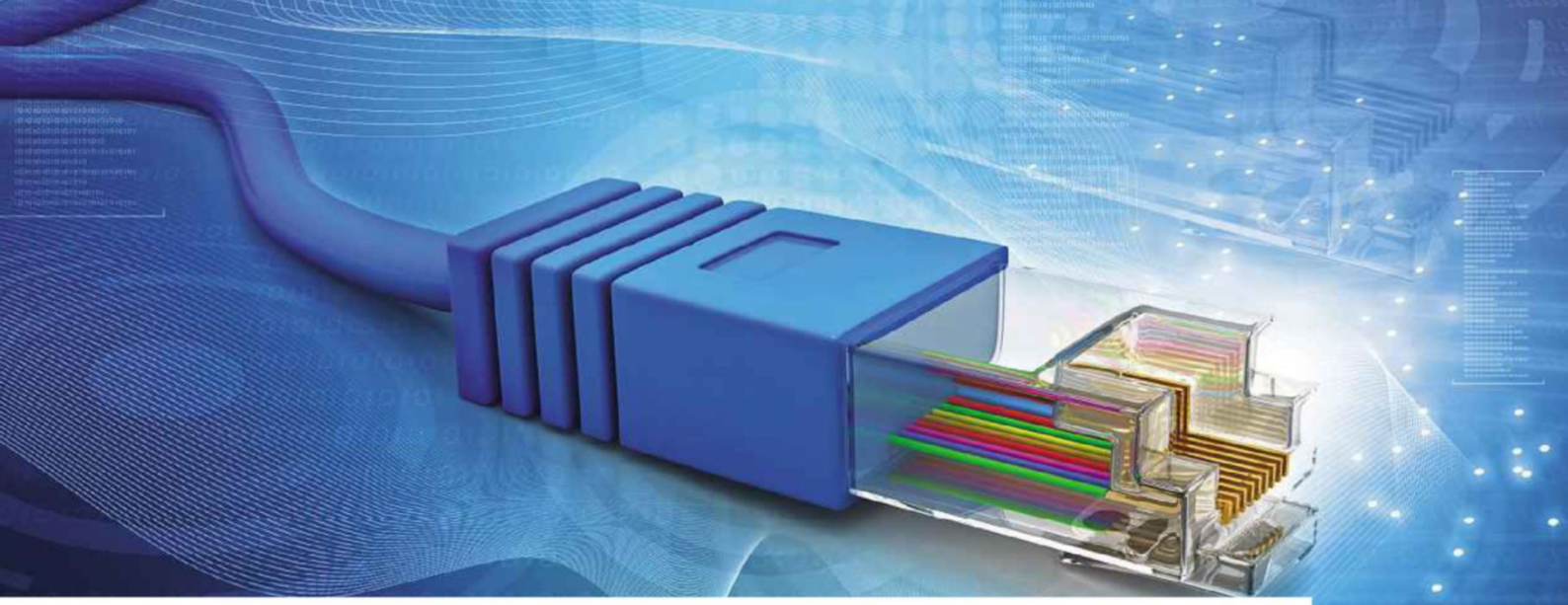

than individual adaptors, and £25 is about the low end for up-to-date dual-adaptor kits. You can spend a little less for older / end-of-line HomePlug adaptors, but the TL-PA411 kit costs only a third more than the cheapest HomePlug kits on sale but offers speeds more than twice as fast. It's not just cheap; it's incredibly good value as well.

As it happens, TL-PA411 adaptors use HomePlug AV2, which means a top speed of 500Mbps – five times what Fast Ethernet can handle and half the speed of gigabit Ethernet, so it's no slouch. The range of the technology is 300 metres, which is more than adequate to cover all but the most extravagant mansions, and built-in encryption prevents anyone else from trying to snoop on your signal too.

With single-button pairing, dynamic QoS multimedia support and indicator lights for at-a-glance troubleshooting, the TL-PA411 is an ideal way to extend your network using HomePlug – provided, of course, that your traffic requirements aren't particularly demanding. If you're running a Fast Ethernet or Wireless N network, this is the kit to go for.

High-end HomePlug Kit
Devolo 9378 (£100)

If you want a better type of HomePlug networking, it's tough to come by, but the Devolo 9378 is probably the most impressive of the high-end models. Although it runs the standard AV2 protocol (making it cross-compatible with other HomePlug networking hardware), it also runs a modifier that allows it to reach incredibly fast speeds of up to 1200Mbps – faster, even, than gigabit Ethernet. The same technology also improves the range of the signal, should that be an issue for you.

One of the its features – the kind you only find in higher-end HomePlug adaptors – is the pass-through power socket, which means that each HomePlug adaptor incorporates a power socket, which you can use to power another device. The loss of a plug socket is one of the more frustrating things about HomePlug, so a pass-through is particularly welcome – you could theoretically power your laptop or router off the same plug your network connection goes through!

Naturally, because its input ports are gigabit Ethernet, you'll never get a higher rate than that across your entire network, but as long as your power cables are up to the challenge you'll never experience bottlenecks. Crucially, a higher transfer capability means it'll even produce faster speeds on networks that can't get anywhere near 1200Mbps. Practical tests show that it's anywhere from 30-50% faster than the average AV2 HomePlug kit, so speed is definitely what you're paying for. Assuming you don't want to use a wireless alternative, this is how much you have to spend. **mm**

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HOW TO SHARE MEDIA ON YOUR HOME NETWORK

James Hunt tells you everything you need to get your media moving

One of the benefits of having a network is that you can use it to share files and resources to every device in your house, and perhaps at the top of the list of stuff worth sharing is your media. That might mean DVDs you've ripped, videos you've downloaded, pictures you've taken or music you've bought.

There are many ways that you can share media on your network, with varying degrees of success, ease and compatibility. So you can figure out what works best for you, here's how to get started with some of the most popular methods.

Router Sharing

If your router has a USB port, there's a good chance that it supports media sharing without any additional software. This is an ideal way to get started, because it ensures that any device on your network can access the shared media so long as it can access the router. Additionally, because your router is your network's point of contact with the internet, some allow you to stream your media from anywhere with an internet connection – all you need is your WAN IP address and the relevant access credentials.

To take advantage of router-based media sharing, you need to have some form of USB storage available. This can be a USB flash drive if you like, but if you're sharing video it makes more sense to have a terabyte hard drive. Note that some external drives require a separate power supply, but it is possible to find external hard drives that draw their power from the USB socket.

To enable media sharing on your router, you should attach the hard drive and then log into the back end. The appropriate option shouldn't be hard to find and enable. Although it varies from router to router, you should have the ability to share the entire drive or pick specific folders, and you may also be able to set up access credentials, change the device name and enable or disable external access.

One of the benefits of attaching storage directly to your router is that it removes a potential bottleneck in file access. A USB 2.0 port has a maximum speed of 480Mbps, and a USB 3.0 port can transfer at speeds higher than 5000Mbps. You're far more likely to have problems with the speed of the storage media before USB throughput becomes a problem.

By contrast, a storage device connected over a weak wireless connection may have insufficient bandwidth to stream to another network device due to range or interference. Connecting straight to

> **The primary benefit of sharing media using a NAS unit is that they're better at serving multiple users**

a router ensures you only have to worry about the signal strength of the device requesting the media – not the device serving it.

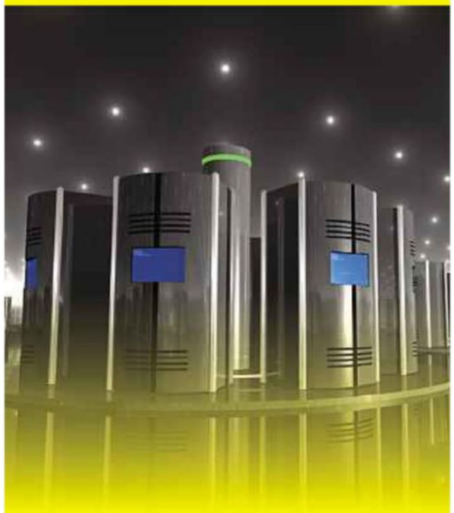
Some particularly fancy routers even incorporate their own hard disks for storage, but we'd advise against choosing them. Detachable storage isn't just cheap; it's also easy to replace if it fails, whereas drives provided inside routers may be difficult, if not impossible to repair yourself. Aside from the very minor benefit of potentially freeing up a power socket, there's very little that makes integrated router storage a good idea and a lot that makes it a bad one.

NAS Storage Sharing

NAS (network attached storage) units work in a similar manner to router-attached storage but have a few major differences. Perhaps the most obvious is that they don't attach to your router over USB but over a standard Ethernet cable or wi-fi signal. Where router-attached storage uses your router's CPU to process and share files, NAS units can do it themselves and usually run dedicated server software, which is far more powerful than anything most routers run.

NAS devices are also more likely to contain more than one drive, whether that's mechanical or solid state. The units are often delivered with empty bays so you can install the drives you want yourself, and units that house multiple drives are usually able to run in a RAID configuration to ensure the greatest access speeds and data integrity across access by multiple users.

The primary benefit of sharing media using a NAS unit is that they're better at serving multiple users. If you have too many people accessing the same content, a single-drive solution could be slow and unreliable. In this situation, the obvious way to speed up access is to use some kind of file server that serves the content in a smarter, more network-friendly way: for instance, using two hard drives with mirrored content. You could build a PC to use as a server, but that's a potentially noisy and bulky solution even if you already have



MEDIA SERVER SOFTWARE

Plex
(plex.tv)
Multi-platform, multi-device, easy to set up and packed with high-end features such as mobile streaming and native apps on tablets and smartphones, there's little to dislike about Plex and a lot that makes it worth trying out. The desktop software is free, but mobile apps cost $5 each.

Subsonic
(www.subsonic.org)
Slightly unusual in that it's primarily a music streaming application, Subsonic does also support video streaming over HTTP, with support for remote access. The podcast management feature is particularly desirable, though! The software is free, but you have to donate $15 for a licence to use it with mobile apps beyond a two-week trial.

Serviio
(www.serviio.org)
A premium (by which we mean paid) app costing $25 for the pro edition, Serviio runs on all major platforms, supports all major consoles and transcodes media, while the pro version adds web-based support and access controls.

Windows Media Player
(windows.microsoft.com)
You may not be aware, but Windows Media Player incorporates a DLNA server – just not a very simple one. Click the 'stream' option, select 'Turn On Media Streaming' and follow the instructions. You'll have to set up a media library too!

the hardware lying around. A NAS unit is a much cheaper and more minimalist way to add fast, high-capacity storage to a network.

The ability to choose your storage means you get a lot of flexibility too. The low price and high capacity of mechanical drives makes them a strong choice, while SSDs are optimised for local application-style access. This means that SSD network storage costs a lot but shows few benefits over the cheaper alternative.

While it's possible to get fully wireless storage devices, the best NAS performance is gained when you attach a NAS device to your router using gigabit Ethernet, which ensures the consistently high, uninterrupted transfer speeds required for streaming media.

In general, NAS units are aimed at larger networks, but that doesn't mean they don't have some use in the home. Like router-attached storage, they often incorporate a web server so that users can access files when outside the home, but their software tends to be more complex. Many have cloud-storage capabilities built in and can also be used to store scheduled backups in case of a hard drive failure in your main PC. If your plans stretch far beyond simply sharing videos and music on your network, there's a good chance a NAS unit will meet whatever needs you have.

DLNA-compatible Media Servers

The Digital Living Network Alliance is a trade organisation, which exists to help define and guide interoperability standards between the various network-enabled smart devices in your home. One of their jobs was to produce guidelines that ensure a media server hosted on your network will be detected by other networked devices. This is how it came to be that your router can serve media to your Xbox, PlayStation and iPhone without any specific software needed.

The existence of this standard means that if you prefer, you can simply share media from your existing PC by installing a DLNA-compatible piece of server software. There are many programs that do the job, but they all work in much the same way: you install the software, it scans your system to create a library, and it then streams that library to devices that request it.

The benefits of this are that you don't have to move your library off your PC, so if you store a lot of media on your system, you don't have to buy any extra hardware and can keep it all in a single, relatively safe place. There's a much smaller chance of anything stepping on your hard drive or knocking it off a shelf if it's stored inside your PC. It's also easier to administer the content, since external devices might force you to use management software to add and delete items. Altering your media library when you use server software is as simple as dragging and dropping a file.

Using an application in this manner also gives you a slight edge, in that the system will have access to your codecs and processor power. Routers, NAS units and set-top boxes simply don't have the processing power a full-size desktop or laptop does, so if you attempt to access media in a non-native format, they'll simply refuse it. Most DNLA-compatible software will at least attempt to transcode the media into something the target device *can* access. This is especially useful for open-source file containers like OGG and MKV, which often aren't supported by big-brand devices, which prefer to push users towards their own preferred formats.

> **"If you store a lot of media on your system, you don't have to buy any extra hardware"**

The downside to this is that media servers are only much use when your PC is switched on. It's no help to have your media on a PC you switch off overnight if you want to watch a movie on your tablet before you go to sleep. By comparison, the content on routers, NAS units and set-top boxes tends to remain available 24/7.

Although there are too many media servers to realistically look at them all, you can find more information on some of the most popular pieces of software in this article's Media Server Software boxout.

Media Streaming Set-top Boxes

Operating somewhere in the space around router storage and NAS units, media-streaming set-top boxes are hardware devices that connect to your network and can store and share media. The main difference is that they can connect directly to your television as well.

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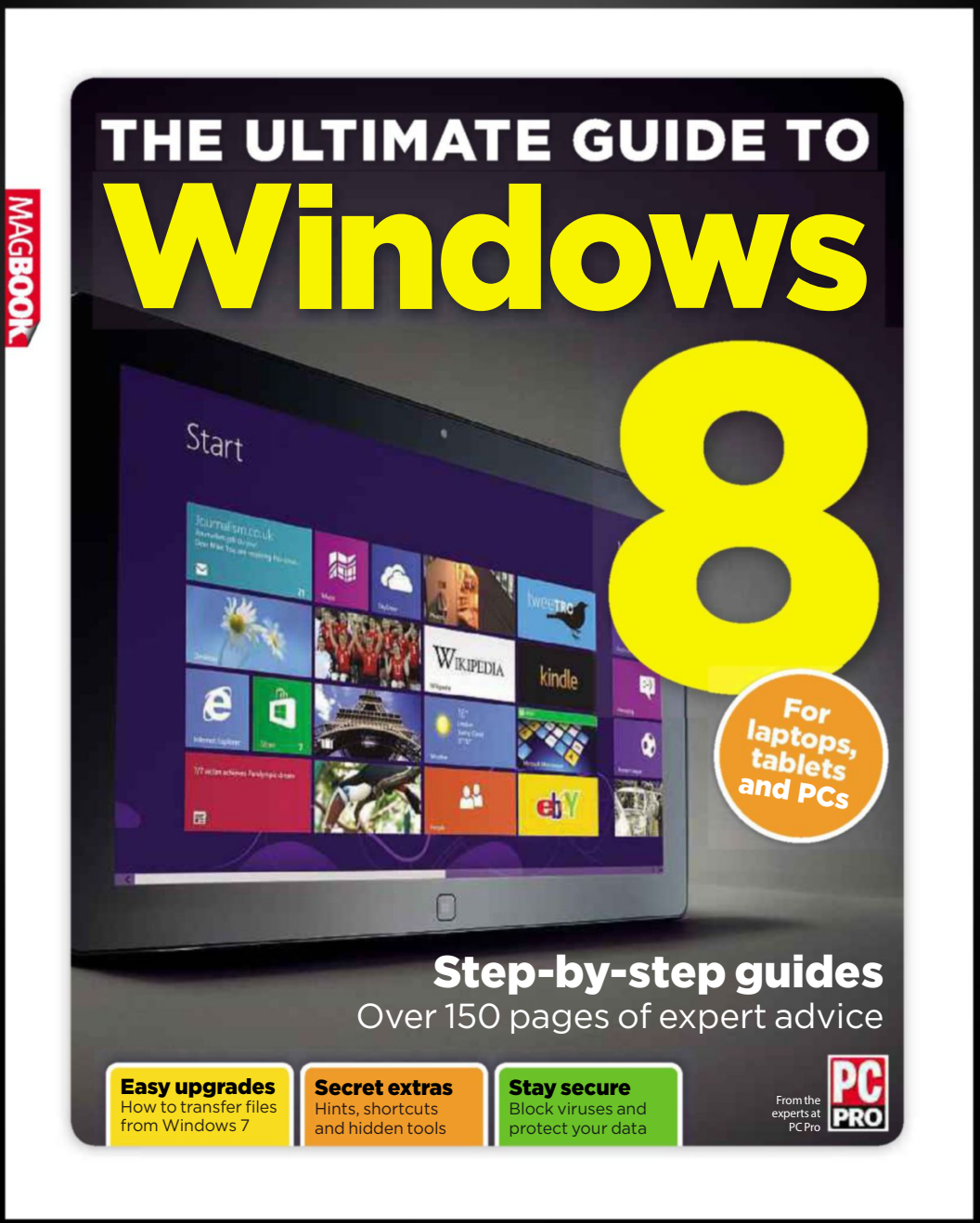

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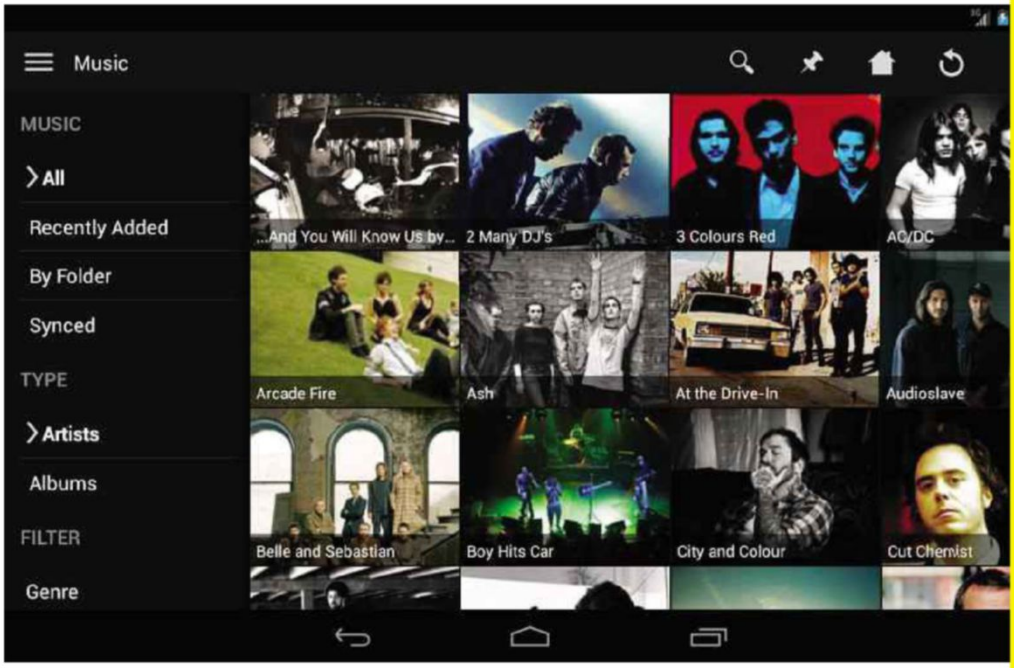

The range of devices that might qualify under this definition is huge, though, so we'll give you some concrete examples. An Xbox 360 can stream media from any available DLNA server to a TV, meaning you can access them without a smart TV. A Chromecast plugs into your TV and can stream media direct from your PC's browser, without the need for a DLNA server. The G-Box Midnight MX2 runs Android and XBMC with 8GB of storage for sharing local media. There are literally hundreds of devices that do this type of sharing.

The benefit of these is that they can turn any compatible screen into what is essentially a smart TV. If you have an old LCD panel hanging around, a laptop with an HDMI-in port or even a CRT TV with sufficient signal converters, you can give it the ability to access media over your network. You can even combine it with a server on your PC to widen the options available to you. Some will even pass-through your standard TV signal, giving you the ability to record and store broadcast media, and most come with some ability to access IPTV services such as iPlayer.

The problem with media streaming devices is that they either tend to be

and the features are inconsistent at best. It takes a lot of research to find the device that's right for you, and even more to make sure you won't have to find the latest Korean firmware in order to make it work with your particular brand of television.

Still, with so many options available you should be able to find a device that does what you want, and the fact that they work directly with your TV makes them one of the most convenient ways to stream media outside of a full-size HTPC.

Again, there are too many media streaming devices to fully cover them all, but you can see our thoughts on some of most popular in the Media Streaming Devices boxout. **mm**

> **"It takes a lot of research to find the device that's right for you"**

MEDIA STREAMING DEVICES

Roku Streaming Stick
(www.roku.com/uk)

Full of apps and supporting any HDMI-enabled screen, the Roku Streaming Stick is a genuine competitor to ChromeCast devices and even has its own remote control. It's a little pricier than ChromeCast at £50, but it does all the same stuff and more.

Amazon Fire TV
(www.amazon.co.uk)

A powerful and well-designed set-top box that complements the Fire tablet perfectly, not to mention Amazon's own streaming services. Voice search is also a fun feature, though it takes some getting used to. At £79 it's not too expensive considering what you get, and its Android-based software means you can even use it to play games.

Apple TV
(www.apple.com/uk)

Prices start at £79, but if you have an iPad or iPhone you'll know that's Apple's idea of a ridiculous bargain. Still, support for AirPlay screen-sharing and iOS apps mean it's worth buying if you've already dipped your toes in the Apple ocean.

Google ChromeCast
(www.google.co.uk/chrome/devices/chromecast)

Super-cheap at just £30, the Chromecast doesn't have any storage of its own, but it will plug into any HDMI port and connect to your PC, tablet or phone to share any media you have available. It's not hugely powerful, but it is cheap enough to offset any concerns in that area.

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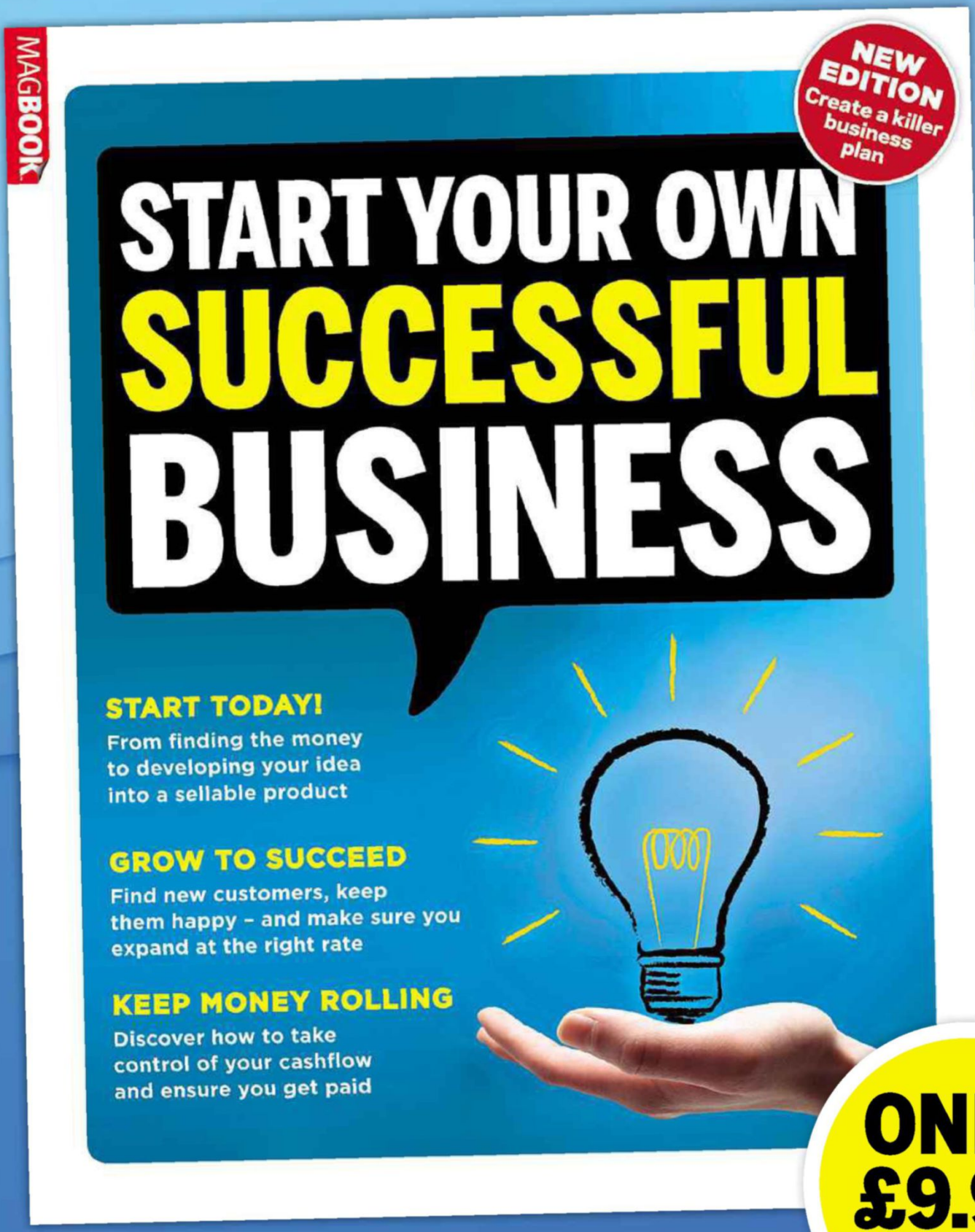

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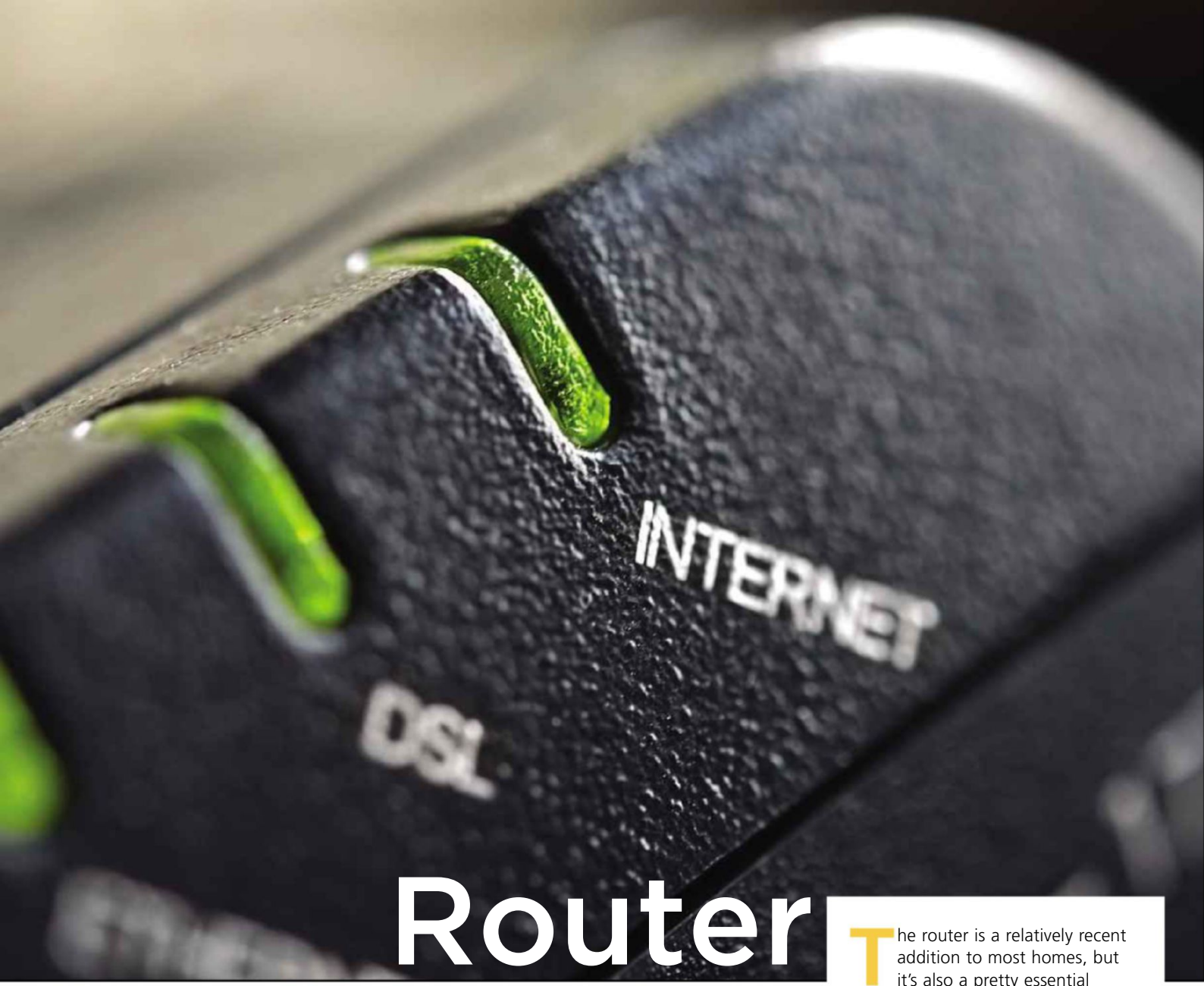

Router Settings & Statistics Explained

Use our handy guide, and don't let your router drive you to despair

The router is a relatively recent addition to most homes, but it's also a pretty essential one: between broadcasting a wireless signal, sharing an internet connection and allowing multiple devices to share content, they're one of the most practical additions you can make to any household with more than one computer.

However, one problem with routers is that most of us get them from our ISP, which install and activate them for us. Routers are so essential that once they're working, the temptation is to leave them alone completely – to treat them as a black box that takes internet in one end and spits it out the other.

This, unfortunately, ignores the huge range of options and abilities available to you. If you've ever looked inside your router settings, you probably know that there are hundreds of options to play with. Some are self-explanatory, but a lot aren't. And so that you can start to understand what those options do, we've taken a look at the most common ones.

Internet Connection Statistics

Most routers offer a ton of useful information about the health, performance and current status of your internet connection – as long as you know how to read it. Here are some of them.

WAN IP Address: All computers on a network have an IP address so they can communicate with one another. On your local area network (LAN), all devices have an address that probably looks like '192.168.x.x', but this only applies to devices connected to your router. The WAN IP address is your router's IP address on the wide area network, which in practical terms means the internet. It's useful to know this if anyone ever needs to connect to your system without the use of a third-party server.

Primary/Secondary DNS Server: When you type in a web address, one of the first steps your system takes is to try to resolve the domain name to an IP address, which it does by connecting to the DNS (domain name system) server. Most DNS servers are automatically assigned by your ISP, but if you're worried they might not be working, change them to the OpenDNS IPs: 208.67.222.222 and 208.67.220.220.

Gateway: The gateway is a network point that acts as the entrance (or, indeed, gateway) to a larger network. In the sense of ISPs, gateway IP addresses show the computer you connect to at your ISP. They should be automatically assigned when your connection goes live, but as with the DNS servers, it's possible to change this so that your connection uses a different system – a proxy server or VPN system, for example.

Line Attenuation: Attenuation values, given in decibels, measure how much the signal has degraded from the main network hub at your ISP. High degradation means slower, less reliable connections. The lower the value is, the better. Anything under 20dB is excellent, under 50dB is acceptable, and anything over 50dB is likely to cause connection troubles. Bad attenuation usually means there's trouble with the wider network infrastructure outside your home, so contact your ISP or phone provider.

Line Quality	
Upstream line rate (kbit/s):	1999
Downstream line rate (kbit/s):	39998
Upstream noise safety coefficient (dB):	29.1
Downstream noise safety coefficient (dB):	17.7
Upstream interleave depth:	0
Downstream interleave depth:	0
Line standard:	VDSL
Upstream line attenuation (dB):	16.2
Downstream line attenuation (dB):	9
Upstream output power (dBm):	11
Downstream output power (dBm):	14
Downstream interleave depth:	None
DSL up-time:	6 days 5 hours 34 minutes 3 seconds

"One of the most useful things routers do is control your network's traffic"

Network Filtering

One of the most useful things routers do is control your network's traffic, both in which systems can connect to it and how they're allowed to connect. These settings are easy to change, and it's typically useful to understand them.

Firewall: Most routers incorporate some kind of firewall, which blocks unsolicited or unwanted traffic from the internet from reaching computers on the network, primarily as a security measure. Unless you have a good reason to disable the firewall, you should leave it enabled.

DMZ: If you do need to place a computer outside the firewall (for example, to check whether the firewall is preventing a connection you need), then you should set your LAN IP as the DMZ server. Remember to disable the DMZ when you're done, though, otherwise your system will be vulnerable. (The name, strangely, has little actual meaning – it's a reference to a 'demilitarised zone'.)

Dynamic DNS / DDNS: Most ISPs assign your connection a temporary IP address, which means that your WAN address changes every few weeks (and sometimes more or less often). If you want a fixed wan address, you can use dynamic DNS services (such as DynDNS.org) to automatically map a web address they provide to your current WAN address so that your system can be accessed from the internet without any requirement to know its current IP address. Adding and enabling the dynamic DNS settings will ensure that your router keeps your DDNS settings up to date automatically.

Port Forwarding: Ports are like virtual 'sockets' which are used by all IP-to-IP connections so that the type of traffic and individual connection can be properly identified. For example, all standard HTTP traffic goes through port 80, while standard

FTP traffic goes through port 21. Normally, a router's firewall will block unsolicited incoming traffic on any port, but port forwarding allows you to ensure that connection attempts are routed to a specific IP address on your LAN – useful if you're running a file server, for example, and want to make sure anyone trying to connect to your WAN IP reaches the FTP server on your computer.

LAN/WLAN Devices

If you look at your router's options, you should be able to get a good sense of what devices are connected to it. This can help you get a reference of the LAN IP addresses in use or troubleshoot connectivity problems by allowing you to see which systems are connected to your network and how.

Devices/Network Map: Sections along these lines will show you, at the very minimum, the IP address of a connected device, the unique MAC address and the network name it has been assigned (for instance, 'simons-ipad' or 'printer'). Some routers will also allow you to alter the name, give each device a preferred IP address and even block the device from connecting entirely. You should also see the method by which a device is connected, whether that's wireless or cabled. This section is useful for checking whether a device has successfully connected to the network, as well as checking for potentially unauthorised devices.

LAN Interface: You may see a section giving statistics for the 'LAN interface'. This specifically pertains to the Ethernet ports on your router and should tell you which of the ports are active, as well as the MAC address of your LAN controller so that you can check whether your system's connection is communicating with the right device.

DHCP server: Unless otherwise instructed, the DHCP server assigns the first free IP address in its specified range to any device that connects to the router. If your router has the IP address 192.168.1.1, the DHCP will probably start at 192.168.1.2 and end at 192.168.1.254. The DHCP server should remain enabled unless you have a specific instruction to turn it off, though chances are that you won't ever need to do this. You should also be able to find a DHCP table (this might be part of the devices or network map section), which will explain to you how many devices are currently using IP addresses assigned through DHCP. Note that DHCP will not assign IP addresses to devices that specify their own, and it shouldn't allow an IP address that's already in use to be reassigned.

UPnP: UPnP stands for 'Universal Plug and Play', and as long as it's enabled, it should mean that you don't have to manually specify port forwarding and redirection. Essentially, it automatically creates port-forwarding rules as they're needed, linking them to the correct IP address so that you don't have to do any tedious reconfiguration. For home networks, there's almost never any good reason to disable it.

Wireless-Only Settings

Wireless networks come with their own terminology and functionality, much of which only affects wireless access, rather than the entire LAN. These settings can help you tweak and troubleshoot your wireless network, as well as better understand what it's doing.

WLAN Frequency: If you're running a Wireless N or AC network, you should have the ability to activate and deactivate access on certain frequencies. In general it's worth leaving both enabled, though if you have enough control, you could set one up as a temporary guest network to only be enabled when someone wants to use it. Note that Wireless AC can only communicate on the 5GHz band, so if you want to do this, you should disabled 2.4GHz access.

SSID Broadcast: The 'Service Set Identifier' is a fancy term for your wireless network's name. This is what appears in the list of available networks when you search for one. You can change this to make it more easily identifiable to you, but beware that other people can see it too, so don't change it to anything that might give away your location or personal details. You can disable SSID broadcast so that casual opportunists won't be able to try to connect to your network, but it's no real security measure. Best to leave it enabled.

Encryption/Security Settings: This is an entire article in its own right, but suffice to say that you ideally want WPA-PSK + WPA2-PSK support enabled for your security, with TKIP+AES as your encryption mode. Older devices might be incompatible with these standards,

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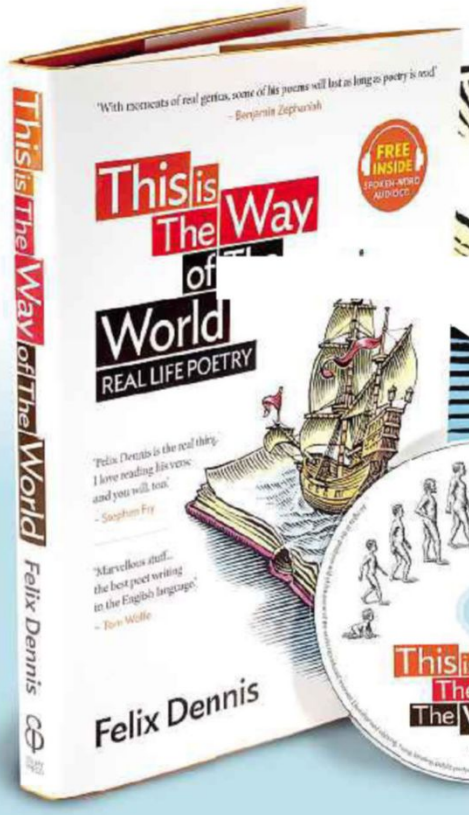

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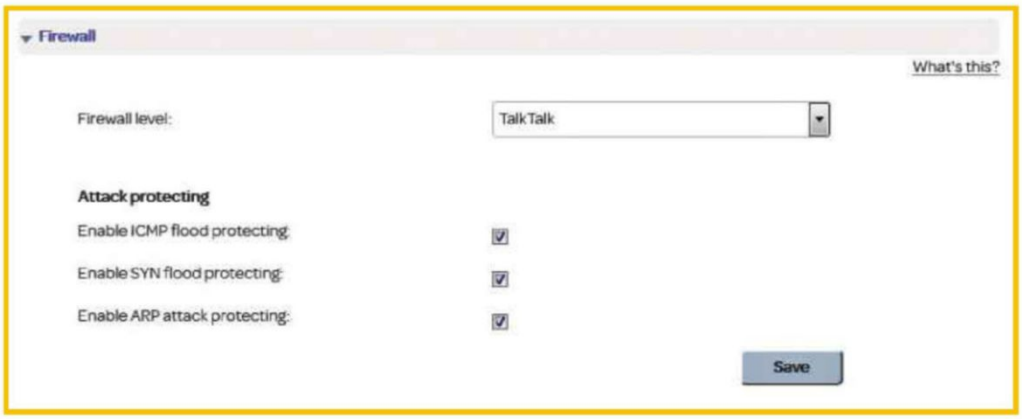
in which case you can switch to an earlier version (such as WEP), but this does represent a security risk – WEP and even WPA are both easily cracked.

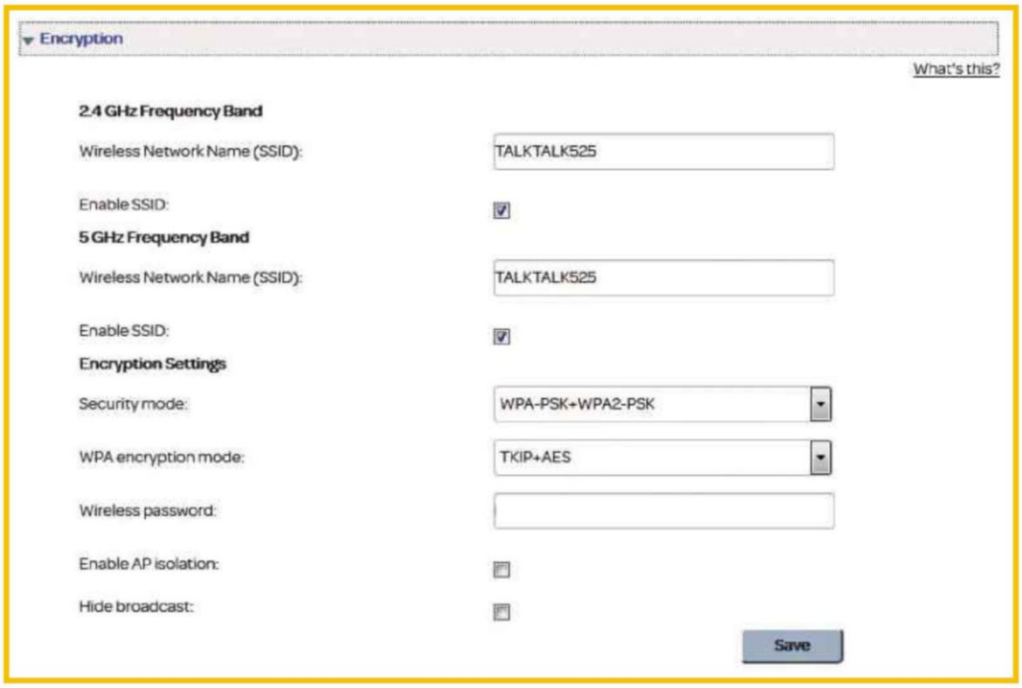
AP Isolation / Access Point Isolation: This setting, when enabled, prevents any client device connected to your wireless network from being able to communicate with the other client devices on your wireless network. It's especially useful if you're running a public hotspot, as it creates an extra level of security that prevents users' systems from accessing one another. Note that it only prevents communication between wireless clients – they can still access any device connected over cabled Ethernet.

Transmit Power: Very few (if any) routers will allow you to increase the transmission power, but some will allow you to lower it. All this does is proportionally reduce the range and strength of your wi-fi signal. The only reason you might want to do this is to prevent your signal from being detectable at a certain distance (perhaps you live near a bus stop or café and don't want your signal to be noticed by members of the public) or if you want to lower the interference with other wi-fi signals, such as your neighbours' or a second network in your own home.

Transmission Mode: Allows you to select whether your antenna is broadcasting in Wireless A, B, G, N or AC, as well as any technically supported combination of the various standards. There's no real reason you'd want to disable Wireless N access in favour of the much older, slower Wireless A standard, but if you have old hardware you ever want to reactivate, it might prove useful to know that it can be done.

Channel: Wireless channels can be altered to lower interference. Add 5 to the current 2.4GHz channel or 4 to the current 5GHz channel to change it to one that should be free from any interference you're currently experiencing. If your router supports it, an 'auto' setting will cause it to rotate channels automatically if it detects interference.





"Very few (if any) routers will allow you to increase the transmission power"

WMM: This setting allows you to enable and disable 'Wireless Multimedia Extensions', an automatic Quality of Service setting that prioritises voice and video traffic to ensure the smoothest possible transmission.

WPS: Wireless Protected Setup allows you to automatically pair a wireless device with your wireless access point using one of several configurations: push button (manually activate a search on both devices), WPS by Client PIN (enter a PIN from the client system into your router) and WPS by Access Point PIN (enter a PIN from your router into the client system). You can also disable WPS entirely, which is useful for preventing unauthorised network connections. Push-button WPS theoretically allows anyone with physical access to the router to bypass the wireless security, so if the router is in a public or shared space, it's wise to disable the setting. **mm**

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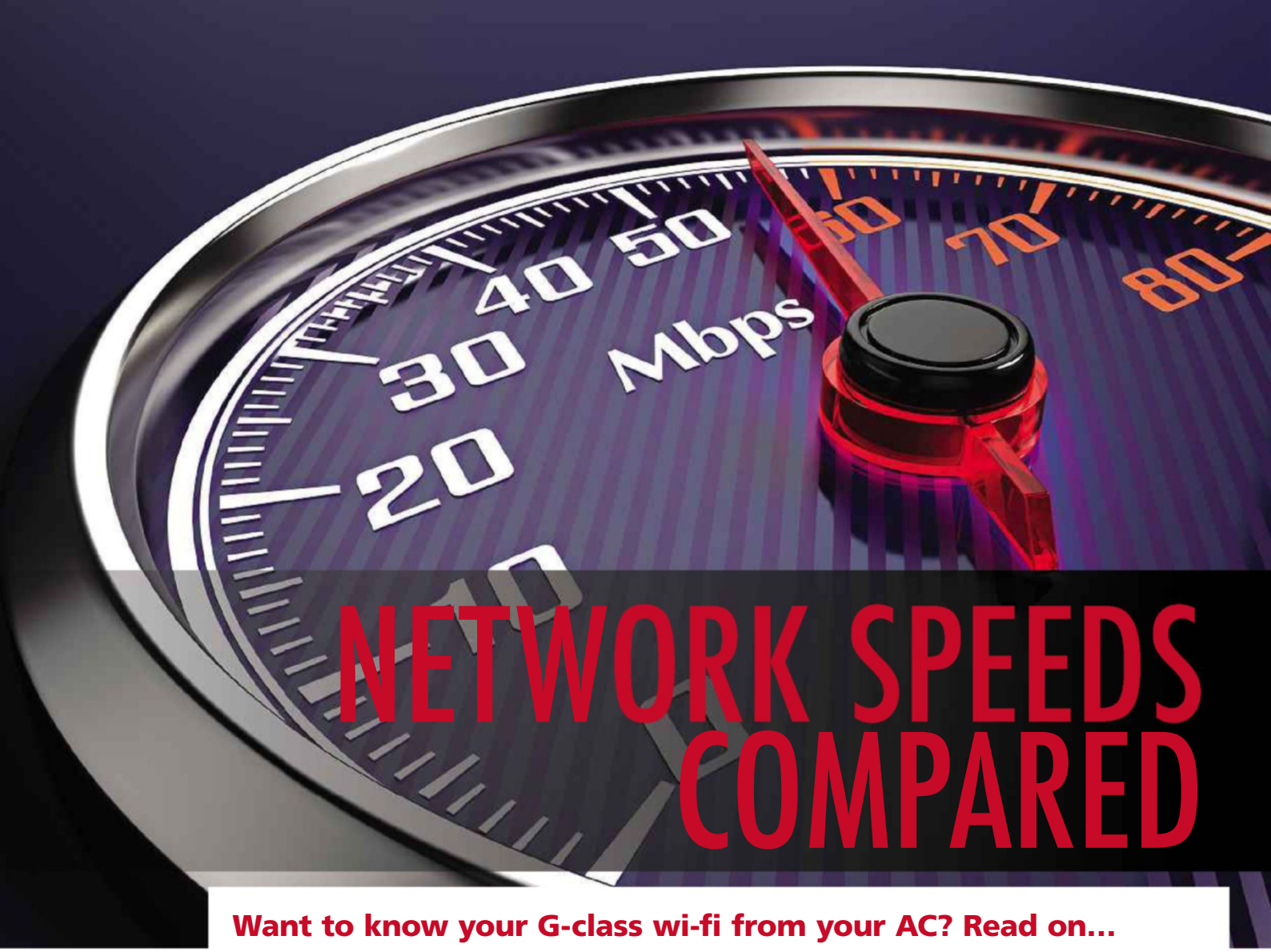

NETWORK SPEEDS COMPARED

Want to know your G-class wi-fi from your AC? Read on...

There are many different version of wi-fi, all of which run at different speeds and use different technologies. But how do they compare, and which should you be aiming for? We've untangled the various kinds of wi-fi you might be running so you can make an informed decision about your networking hardware.

First, we should point out that the speeds are given in megabits per second (Mbps). One megabit is 1,000,000 bits, which is 1,000 kilobits, 125,000 bytes or 125 kilobytes. However, because modern files are quite large, it's probably more practical to think in terms of megabytes. A connection of 8Mbps can transfer approximately one megabyte per second, so divide any speed by eight, and you'll get a decent indication of how many megabytes it can transfer a second.

Note that although they operate in similar ways, a fast network won't necessarily help you download files quicker from the internet. Your network might be running at 600Mbps, but this is only the maximum speed between you and other points in your network. Your downloads will still be bottlenecked by the speed of your internet connection, which is typically within the 10-100Mbps range, depending on your provider and package. It's possible to have broadband which is faster than your network connection, but in most cases any speed benefits you experience from a network upgrade will be the result of having a stronger, more reliable wireless connection rather than a faster one.

Wireless G

The Wireless G standard, IEEE 802.11g, was released in 2003 and increased wireless speeds to a then-impressive 54Mbps using the 2.4GHz band, with a maximum range of 38 metres. Indeed, it was so much better than the existing wireless alternatives (Wireless A and Wireless B) that manufacturers and consumers began to adopt the technology even before the standard had been officially ratified, so great was the desire for better speed and reliability.

These days, however, Wireless G falls well short of the speeds you'd want a network to provide, but many people are still unwittingly using it because they have an old router or an old network card or possibly both. The problem is that Wireless N hardware is backwards compatible with Wireless G, so even if one piece of hardware gets upgraded, it's possible to maintain a Wireless G connection without realising – you need Wireless N compatibility at both ends of the transmission to get a Wireless N connection.

Although it isn't officially deprecated (in that Wireless AC hardware still supports Wireless G devices) it is, at this point, well over a decade old and it's been out of date for almost as long. If you do find Wireless G hardware in your system, it can quite easily be replaced. We'd urge you to get on that as soon as possible.

Wireless N

The wireless N standard (IEEE 802.11n) was officially finalised in 2007 (though updated in 2009)

and was primarily designed to increase network speeds, although it also doubled the range to up to 70 feet. Most network hardware manufactured in the last seven or eight years will be compatible with Wireless N, and that includes things like smartphones and tablets; only the very latest hardware supports newer standards.

Wireless N's architecture means that speeds vary massively depending on the type and the amount of hardware used, but a single-antenna implementation can easily reach up to 150Mbps. Wireless N can use both the 2.4GHz and 5GHz bands for transmission, and officially it's possible to use multiple channels and antennas to create a multiplex connection with a speed of up to 600Mbps. Unofficial implementations have even been able to produce a 900Mbps connection.

Although Wireless N is gradually being replaced by the newer Wireless AC standard, it's still more than adequate for modern networking. Even an average Wireless N network is fast enough to stream multiple forms of online media without difficulty. It also has the largest range of any current standard – up to 70 metres indoors, effectively twice the distance that Wireless G and Wireless AC can operate at.

At present, most network hardware is aimed at providing Wireless N compatibility, meaning there's no great need to update Wireless N hardware yet. It'll be a couple of years before Wireless AC definitively replaces Wireless N, so it's only worth upgrading if the hardware needs replacing or you're having specific speed problems that a Wireless AC connection might solve.

Wireless AC

The latest and fastest iteration of wi-fi, Wireless AC (IEEE 802.11ac) was only officially released at the end of 2013, although hardware that supported the standard actually came out a little sooner. Although the standard only operates on the 5GHz band, Wireless AC certified hardware must also incorporate a 2.4GHz antenna to ensure backwards compatibility with Wireless N and G. The practical upshot of this is that most Wireless AC routers and switches provide two separate access points: a 2.4Ghz Wireless N one and a 5GHz Wireless AC one.

Wireless AC's chief advantage is its speed. A single Wireless AC connection alone will provide a connection of up to 433Mbps, but this is usually paired with a single Wireless N connection (150Mbps) to give a minimum speed of 600Mbps (often annotated as AC600). Various speed combinations exist: dual N, dual AC (1200Mbps) is common, but the fastest hardware has a throughput of 3200Mbps – 600Mbps on Wireless N and 2,600Mbps on Wireless AC.

Although Wireless AC is faster than basic Wireless N, it does have one disadvantage: a shorter maximum range of just 35 metres. However, the fact that most Wireless AC access points also runs a Wireless N access point can compensate for this shortfall – your network will still cover the same area, though you'll only have access to the higher-speed coverage when you're close enough to the access point.

At present, Wireless AC hardware is expensive, and most devices don't yet incorporate it as standard. That is slowly changing, though – the latest high-end tablets and smartphones now offer Wireless AC support. Some ISPs have begun to provide Wireless AC hardware to customers, but at present it's not a requirement for most households. It may be worth upgrading to Wireless AC if your hardware breaks or needs replacing due to age, but don't do so because of speed unless you know your network has unusually high demand. At present, if an existing Wireless N network isn't fast enough for your household needs, it's more likely because of poor-quality hardware, a poor-quality signal or some misconfiguration, rather than genuinely high requirements.

The Next Wireless Standard?

The future of wireless networking isn't yet certain, with a number of alternative technologies waiting in the wings. Some are revisions of wi-fi, others are entirely new. Wireless AD, AH, AJ and AX may all end up in homes in one form or another, and we'll look at these technologies (and more) elsewhere in this special. Don't worry that your hardware is going to be out of date soon, however; it won't be until towards the end of the decade at the earliest that these technologies are used in homes. Wireless AC still has a long future ahead of it. **mm**

Dual band wireless router

Wireless AC2600 router

NEXT-GEN NETWORKING

What's around the corner for networking hardware? James takes a look

Wireless technology might be improving fast, but in some ways it'll never be good enough. No sooner has Wireless AC, with its gigabit-level speeds and improved reliability, made the first creeping steps toward becoming standard than we're forced to look to future forms of wireless networking. After all, Wireless AC might be okay for streaming HD video, but what happens when you want to stream 4K video? Or if you want to provide networking over areas greater than Wireless AC currently allows?

The answer, of course, is that you have to look to whatever comes after the current iterations of wireless networking. And while it's not certain which one will end up in our homes, there are several candidates already in various stages of development.

WiGig / 802.11 AD

Originally managed by the Wireless Gigabit Alliance (WiGig) and later folded into the Wi-Fi Alliance, WiGig was a specification based on existing wi-fi (802.11) technology. As a modified version of the specification, it was named 802.11ad or Wireless AD.

The intention was to create a standard to enable multi-gigabit communication speeds between two devices, including wireless networking but also as a way to stream high-definition media to devices like speakers and screens. Like existing forms of wi-fi, the Wireless AD specification communicates on the 2.4GHz and 5GHz bands, but it also incorporates the 60GHz band, allowing it to reach speeds of 7Gbps.

Despite this, 60GHz transmissions aren't perfect for wireless communication. The small wavelength means that the transmissions are very susceptible to reflection and have difficulty penetrating walls and passing through other surfaces. It is, essentially, a short-range standard. To compensate for this, Wireless AD's protocol incorporates 'beamforming', which allows it to pick up radio waves that have been bounced off other surfaces, and it can seamlessly switch to a lower, more reliable frequency should the 60GHz transmissions become unstable.

▲ WiGig

The incorporation of 2.4GHz and 5GHz bands into the Wireless AD standard does mean that Wireless AD hardware is compatible with existing wireless technologies, including Wireless AC, but it can experience difficulty if used alongside WirelessHD devices, which are already commercially available. This is because WirelessHD also uses the 60GHz band for its transmissions.

Although Wireless AD isn't commercially available in any

hardware at present, it is most likely to appear first as part of the Wireless USB standard, which would allow high-speed device-to-device transfers using existing USB drivers. Ultimately, the fact that its speed is only in the same range as Wireless AC's theoretical bounds despite significantly increased complexity may prevent it from becoming the next official wireless networking standard.

Wireless AX

Perhaps the best candidate to succeed Wireless AC is Wireless AX. After all, it already has the backing of the Wi-Fi Alliance's VP of technology, Greg Ennis, who explicitly stated that the alliance expects Wireless AX to take Wireless AC's torch when the standard is complete. Of course, he also stated that he doesn't expect the standard to be ratified before 2019, so it could be a while before devices appear.

Still, the fact that the standard wasn't yet ratified didn't stop companies from releasing Wireless AC devices, and the draft specification for Wireless AX will soon be complete enough that the hardware could be released as soon as 2016, provided there's a market for them.

Although Wireless AX is some distance off being realised, its goals and capabilities are already defined. Test hardware has already achieved speeds of 10.53Gbps using just the 5GHz frequency band, which is four to five times the speed of the fastest Wireless AC hardware currently available, and around a third above Wireless AC's theoretical maximum.

Wireless AX will also improve wi-fi's performance on other levels. Currently, crowded environments with large numbers of users are likely to impede wireless performance, making public hotspots comparatively hard to create and manage. Wireless AX will use its communication spectrum more efficiently to better manage interference and improve existing protocols so that public wi-fi becomes faster and more reliable even under heavy loads.

What makes Wireless AX most likely to succeed is that it is, essentially, the same model of wi-fi we're using now. Unlike the short-range focused Wireless AD (and its long-range cousin, Wireless AH) it should remain on the 2.4GHz and 5GHz bands, meaning easier compatibility and easier manufacturing.

WhiteFi / 802.11 AF

One of the benefits of the UK switching from analogue to digital TV is that a huge chunk of the radio wave spectrum that was once occupied is now free. Areas of the spectrum with no official use are described as 'White Space' – so you can probably guess yourself what WhiteFi is.

And in case you can't… WhiteFi is designed to use unlicensed portions of the UHF spectrum to carry wi-fi signals. Where current devices operate in the GHz bands, WhiteFi would transmit between 54 and 790 MHz. The benefits of such technology are numerous. A transmission range of several kilometres, high obstacle penetration and simpler symmetrical implementation, meaning faster upload speeds for users are just some of the benefits such a technology could bring. Its range means that as well as providing long-range networking, WhiteFi could be used to provide broadband to areas where infrastructure is too expensive or too inconvenient to install.

As with existing wi-fi standards, WhiteFi is licence-free in the UK, meaning that anyone can buy and use the hardware to create a WhiteFi hotspot. Or, at least, they'll be able to when the technology becomes available. Sadly for anyone hoping to set up their own WAN, it's not quite ready for market yet.

Partly, this is because the technology is more complex than wi-fi. Its long range and position in the spectrum means the potential for interference is huge, so all WhiteFi devices in an area would have to communicate with a central database to check which power levels and frequencies are safe to use. It's clear how the system would work in theory, but it hasn't actually been implemented yet.

Speed is also an issue. The fastest implementations of 802.11af are still considerably slower than many of the alternatives, so it's unlikely that any commercial enterprise will turn its focus to implementing home versions of the technology. Without that level of appeal, it's always going to be a niche product.

In any case, the current development trend for wireless technologies is for them to follow in the footsteps of their predecessors. It may even be that technical and commercial limitations will soon prevent any more revolutionary refinements once Wireless AX is realised, and the 802.11 standard has to be finally abandoned in favour of a completely new wireless networking solution. But for now, there are still improvements to be made, and for the next few years, there's still plenty of time left to make them. **mm**

▼ *Wireless AX*

▲ *WhiteFi*

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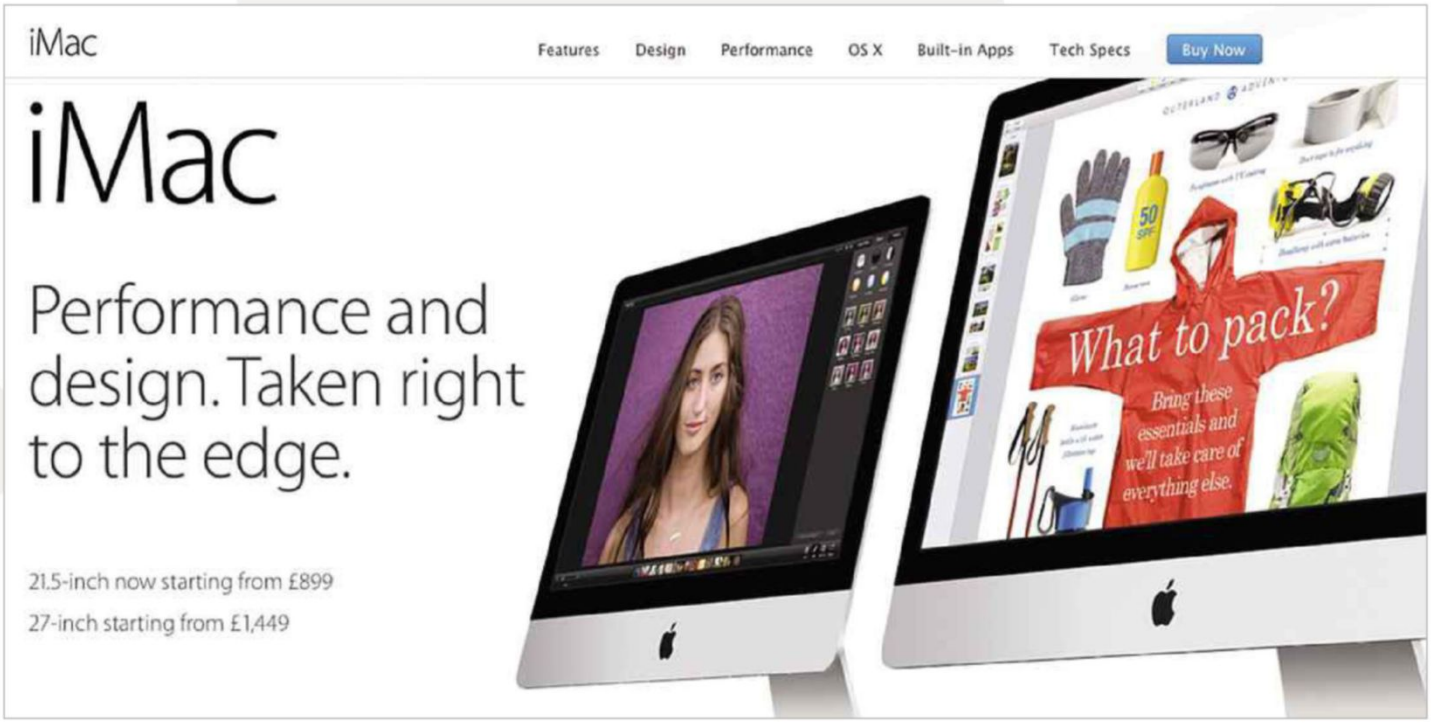
Apple iMac On A Tight Budget

Want to get a piece of that smug Apple-owning feeling? Ian Marks does too, but he isn't paying a fortune for it

Are you a PC user? They're great, aren't they? Cheap to buy and maintain, easy to upgrade and (probably best of all) capable of running pretty much all the software you could ever need, to do anything you could ever want to do. Who could want for anything else?

Well there are people who don't like PCs, hate anything with the word Windows in the title and look down their noses at anyone who uses one. Who could these people be? Why Apple Mac users, of course. Strutting about the place acting all superior because their machine doesn't get as many viruses and actually looks quite nice, for a computer. Going on and on about how OS X never crashes, and how their computer syncs seamlessly with their phone. Don't they just get on your nerves?

They do mine… and I now own an iMac! In fact, I'm writing this article on it as we speak. The problem, as I see it, is not the machines themselves – they are actually jolly nice – it's the people that own them. The word 'smug' often comes to mind.



These are brilliant, but the price is really something special... more than £78 anyway.

Still, I do believe that you can be very normal while owning an Apple computer and having a lot of fun and enjoyment out of it. I also believe that iMacs are within the monetary reach of nearly everyone, and this article will hopefully convince you too.

The Intel Mac

Obviously, you could just go out and buy a new super thin iMac; it'll cost you anything from £900 to over £2,000 depending on what you're after, which seems an excessive amount for what is essentially an i5 PC in a flash brushed aluminum case. You will not be surprised to hear that I didn't go down that route.

> **"You can be a fully paid up member of the Apple iMac smug club for 70 quid. Not bad, eh?"**

The iMac I recommend you get hold of is one of the first Intel based ones from 2006-2008. That may seem a long time ago in computer terms, but actually – despite a few notable cosmetic tweaks to OS X – there is not actually that much difference between 2007's versions of OS X and 2014's Mavericks. Before the letters come flooding in, I know there is probably a vast difference in what's going on behind their respective GUI, but visually it looks pretty much the same to me. The uninitiated would probably never know.

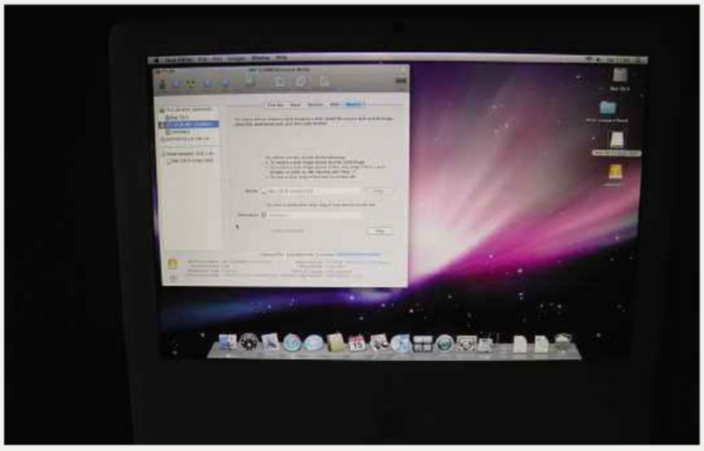
Before 2006 Apple used its own chips, which it gave catchy names like G3, G4 and predictably G5. Becoming bored of chip making, and not wanting to call anything the G6, it jumped ship to Intel. From that point on, the iMac's have just been PCs with a different operating system. Indeed, should you want to break umpteen laws, you can find hacked copies of OS X on the internet that you can install on pretty much any old PC – but I'm not recommending that, either.

If you look on eBay, there are hundreds of early Intel iMacs (usually Core Duo ones) that you can pick up for very little money – especially if you are willing to be patient. It is noticeable that many of them have faulty screens with lines down them. This was obviously a weak point for Apple, and these ones are best avoided – although if you are willing to put up with the odd line or two then you can own a Core Duo iMac for about £30. I'll assume that you want a working screen though, and if you bide your time then you can acquire a fully working one from about £70. That's right: you can be a fully paid up member of the Apple iMac smug club for 70 quid. Not bad, eh?

Well, that was the theory, anyway... so to put it to the test I went and bought one. Be careful you get one that includes a keyboard and mouse, though, as often the cheaper ones do not. You can use any USB mouse/keyboards though, but they don't look as good as Apple's own.

Here is the little beauty, all £78 worth of it – and It still looks quite cool in my opinion

Installing Snow Leopard is easy, if only all OS upgrades were this easy



Trying to setup a Snow Leopard boot disk

Purchasing And Delivery

My iMac (a 2007, 17" screen version) cost me £78 – a tiny bit over budget, if you want to quibble (but, frankly, I don't). It was described as being in full working order, and delivery was only £10. Be careful here, though: these iMacs are quite heavy to be sending in the post, but not so heavy as to warrant the £30 postage some sellers seem to demand. If I lived in London, I could have picked up my iMac for free, though – so shop locally if you want to avoid any extra 'hidden' costs.

As I was at the behest of a delivery service, it was just a question of waiting. I think my iMac got delayed in the Christmas post (either that, or the seller didn't bother posting it for ages, and then blamed the Christmas post) as it took a couple of weeks to arrive. When it did, though, it was well packaged and looked a good buy. There were no dinks or dents and the screen looked very unscratched.

On the whole I was pretty impressed. The only slight problem I could see is that on the fancy aluminum stand somebody has scratched a tiny picture of a part of the male anatomy. It is only about 1/2cm in size, but it is quite suspicious. It could be a co-incidence and just an innocent scratch, but I'm not so sure. If I want to use my machine in polite company I will have to sort that out at some point. The big question, though, was not why it had rude pictures scratched on it, but whether it worked.

After a quick attachment of the keyboard, mouse and power lead I tentatively turned on the machine. Reassuringly it made that strange Apple bonging noise and the screen lit up. Ten seconds later I was sitting in front of OS X Leopard. It worked, and I was a proper member of the iMac society.

OS X: Problems And Upgrades

Now I needed to find out whether I could upgrade my operating system. Unlike Microsoft, which lets you put an OS on any age machine as long as it meets the hardware specifications, Apple dictates a cut off point. In my iMac's case it turned out it could upgrade as far as OS X Snow Leopard (10.6, released August 2009), which was actually only one step up from where it was at the time.

You can buy Snow Leopard very cheaply on eBay, and a little bit of research suggested it was a job worth doing, as this particular progression introduced innovations like iCloud and the App Store. It also looks a little bit nicer, if you're bothered about such things (and as a new Mac, owner you should be), so I bought myself a cheap copy and waited for the postie again.

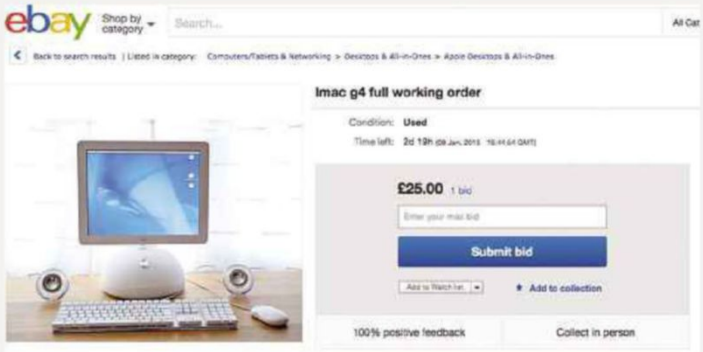
When it did finally arrive (yes, more waiting), installation was easy enough: put in the disc and choose upgrade to Snow Leopard. There are no driver issues with Apple, as its has locked-down hardware. It just installs, asks a few questions and then goes. It's actually quite impressive. You can even make a USB boot disk from the CD.

> **"There were a few issues… mainly caused by Apple itself, as it turns out"**

Snow Leopard actually runs pretty swiftly on my 2007 iMac, and it is hard to fault it really. It boots from cold in about 10-15 seconds, and internet browsing is quite fast. Once I installed a modern version of Firefox, things really improved and during general use you honestly would never know it was an older machine. However there were a few issues… mainly caused by Apple itself, as it turns out.

App Store Issues

Sadly Apple's rules on old computers using its modern operating systems also applies to its software. While OS X Snow Leopard has access to the App Store, for many apps it is a waste of time. Try to download Pages (Apple's word processing software), or Keynote (Apple's version of PowerPoint) and the App Store will say you no. Apparently, unless you upgrade to a more modern OS (and thus machine), it doesn't deem you worthy of word processing. Actually this isn't strictly true; while you can't get it online from the App Store, you can buy it on disc – though, not from Apple. Once again you must turn to eBay, where you will have to buy it as part of the whole iWork 09 suite of software. Useless.



This is one of the coolest computers ever... go on put in a bid

The App Store looks nice, but good luck finding software on it for Snow Leopard

The same is true for many third party apps too. Dropbox won't download from the App Store, but will from Dropbox's website, which is a bit weird. It seems Apple is desperate to stop you downloading software unless you upgrade to its latest OS – and then intent on creating a 'you should buy a newer machine' catch 22 by not actually letting you upgrade on older hardware. I'm aware that my 2007 iMac probably isn't powerful enough to upgrade anyway, but I'd appreciate being allowed to try.

Despite these niggles, the iMac is still very usable. There is a lot of free office software on the web that will run on Snow Leopard: LibreOffice has older versions still available via its website, for example. As an aside: LibreOffice is a great program, and people used to older versions of Microsoft Office will feel right at home. Interestingly, Microsoft's own Office 2011 for Mac's will install and run quite happily on older Mac's – but it's quite pricey.

Now I've got my software though it is time to test whether it is a useable machine on a daily basis?

Using It As A Daily Runner

My big questions was whether I could use my £78 iMac as my only computer. I decided to put away all my other laptops and devices and just use my iMac for all my needs for a week - but would it be up to the task? For those of you who hate Apple and its products, the answer is a disappointing 'yes'. It is most definitely up to the task.

It has either Ethernet or Wireless connections to hook up to your network, both of which seemed fast and reliable. It booted up quickly, ran quietly and never overheated. Browsing the internet was zippy, and no real issues were thrown up. Flash worked well, and most websites displayed properly, including on demand video sites such as BBC iPlayer.

The free office suites I used in lieu of Pages did a good job, and interestingly my HP printer just simply installed itself when plugged in to the machine – although it is a fairly elderly printer, and I'm not sure newer models would fare as well. The Apple keyboard is quite nice to use, and there were no strange typing pains caused by prolonged use of it (mine did have a duff key, though). The Apple mouse, however, was rubbish. As it was one the last of the type that only had one button, I found it very hard to warm to, and I quickly swapped it out for a cheap two-button USB type, which worked perfectly. It wasn't as nice aesthetically, but if people came round to admire my purchase, I could always swap it back.

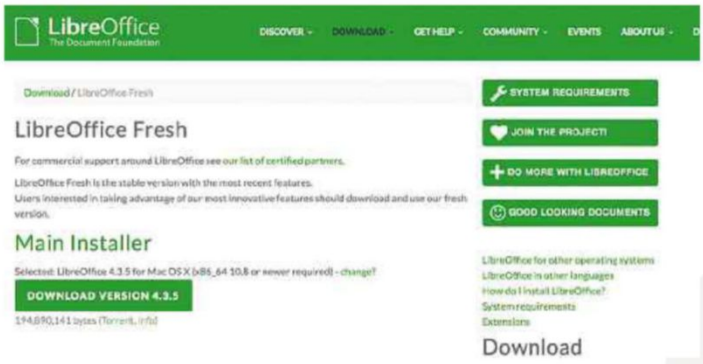
Also it hasn't really dated that much in the way of design. It is little bit chunky in terms of the thickness of the screen, and the white case is all bit mid-2000's but generally it still looks quite good, I think. The screen is of good quality, and is easy to read with nice colour depth. In the week I used it I can honestly say I had no real issues, and if it really was my only computer I'd be happy to use it all the time.

Any Good?

I know, I know that is not the conclusion you Apple haters wanted, but it is the truth. This is a well designed machine and, while it would have been hideously expensive seven years ago, it is now reasonably priced. Snow Leopard holds up quite well as an OS, and hasn't dated as much as XP has. In fact I'm not sure that a seven year old PC would give such a pleasurable experience. I'm willing to be proven wrong, though.

I had initially intended to sell the machine on once this experiment was over, but I think I've grown a little bit too attached to my iMac. It may not work in the long term as a main machine, but as a second computer, or a cheap option for your children to surf the internet on, it is a little wonder. Also, if you really get bored you can install Windows XP on it (or Linux) as it is a PC at heart. Albeit quite a nicely designed one.

Would I recommend that you buy one? Well, I can tell you I have been converted to old iMac's, and may even look into getting one from the next Core 2 Duo generation – expect to pay about £150 for one of these, though. Also a 20" monitor might be nice next time. For now, though, once I've just got to get rid of the rude doodles it'll make a nice family computer. **mm**



LibreOffice is free and a really smart piece of software, and it works

The keyboard may have a duff key, but it's infinitely better than Apple's old one button mouse

Your Letters

Windows 8.1

Having just upgraded from Win 7 to Win 8.1, I'm not sure if I was ready for this set of handcuffs.

My new build has an SSD and a HDD, and I was filled with hope as I loaded the new 8.1 onto my first SSD. Yes, I like the interface, the system is stable, and I have more gizmos to play with and have the choice of the desktop or the Start page. However, Microsoft's desire to have us linked and synced to an MS account in the cloud is breathtakingly frustrating.

Even midway through the loading process we are all but forced to start setting up an account, and once installed, the procedure repeats itself ad nauseam. Every time I load a new MS program or wish to set up one that is part of the OS package, more logging in, same password again and again and again.

Is it beyond the wit of the program compilers/designers to let us install the OS in its entirety without so many interruptions? When the OS and other programs are installed, couldn't we have one page whereby we can set up an account, if we so wish, be provided with a list of loaded programs that can be part of the cloud, giving us the choice by check box, of those we need or want to sync without further need to keep logging in? Any programs added later that can utilise the cloud syncing routine would automatically be added to the list on that same page. Again offering us the simple checkbox choice to sync or not.

After a great deal of thought, I decided to return to my old friend, Win7, where at least I do the thinking and retain some control. Let's hope Win 10 is less intrusive.

J Findlay

Insecurity

I recently read that someone had managed to hack fingerprint security by taking a high-resolution photograph of someone's fingers. On one level, this is quite ingenious, and it's impressive just how advanced digital photography has become. But at the same time, of course, it's terrifying, and it also shows how we seriously need to rethink computer security in future.

I don't think biometric security like this is the answer. Surely a similar trick could eventually be used with retinal scanner - not to mention the ever present risk someone might pull out your eye to drain your bank account.

To be honest, it seems the only place where your information is 100% secure is inside your head, so ultimately it seems a strong password is still the beset solution, in spite of the possibility of people guessing it or using brute force techniques.

So in spite of all our technological advances, when it comes to security, we're still basically at square one!

Leigh Fogarty

Ridiculous Prices

I know all the arguments against piracy, and I do believe that people should be paid for their work, but the media industries need to get real about how much they can charge. What got me thinking about this was when I thought I'd watch the TV show Falling Skies, on the recommendation of a friend.

Unfortunately, it wasn't on Netflix, which I've had a membership with since it launched in the UK. I checked Amazon Instant Video, and it was there, but not on Prime. No, I had to pay if I wanted to watch it. Yes, for a TV show that would have already made all the profit it needs many years ago. How much? £2.49 per episode for HD, £1.89 for SD. Of course, I could buy the series for £10.99 in HD or £9.99 for SD.

On the face of it, that doesn't sound too bad, because that's pretty close to what a DVD might cost, but bear in mind that this doesn't come with any kind of disc or packaging. That means the company behind it is saving on that as well as the cost of distributing physical media, but none of the savings seem to be passed on to consumers.

Now consider the fact you can pick up season one to three for about £20 from Amazon, and you'll see just how ridiculous this pricing is. It's no wonder people return to piracy when the media companies are so greedy.

Alex West

GET IN TOUCH...

By email
letters@micromart.co.uk

By post
Micro Mart
30 Cleveland Street
London
W1T 4JD

Online
forum.micromart.co.uk

Component Watch

If you're looking to take your networking up to AC level, we've got the goods

Staying on a networking theme, this time weeks CW is looking at adaptors that give you support for the latest standards. If you've ever wanted to enjoy the high speeds of a Wireless AC connection, but your current network adaptor just isn't up to the job, here are some discounted alternatives you might be interested in.

Deal 1: TrendNET TEW-805UB
RRP: £20 / Deal Price: £10

Already one of the cheapest Wireless AC adaptors out there, the TrendNET TEW-805UB has just had its price slashed at eBuyer to the point where it's almost criminal not to buy it. It might look chunky and literally sticks out like a sore thumb, but its AC1200 speeds make up for any irritation that might cause. The perfect entry-level piece of hardware for the Wireless AC-curious, and at 50% off undoubtedly the deal of the week as well. Go dig down the back of the sofa, check your old coats, or whatever you need to do to dig up a tenner!
Where to get it: Ebuyer (**bit.ly/1CeJ766**)

Deal 2: Linksys AE6000
RRP: £28 / Deal Price: £21

Significantly less obtrusive than the TrendNET device we just looked at, Linksys' AE6000 is a compact Wireless AC adaptor with dual-band compatibility. However, it's worth noting that it only connects to one band at a time; so you get either 430Mbps connections (via Wireless AC) or 150Mbps (via Wireless N). And easy setup option is available using its WPS button, and it's light, portable and widely compatible with many different systems. At this price, that's more than enough to make it worth the £21 Ebuyer are asking for it (amounting to a handy 25% discount on the RRP. Definitely a great option to go for if you're on the move and want your system to be as compacy as possible.
Where to get it: Ebuyer (**bit.ly/1kmRPbY**)

Deal 3: TP-Link Archer T2UH
RRP: £35 / Deal Price: £30.50

The TP-Link Archer T2UH is a USB-powered wireless adaptor that adds 802.11AC functionality to your laptop or desktop system, with a full-size antenna that allows strong, high-speed, long-range connections of up to 600Mbps. Selectable dual-band connections allow you to find the best connection, while WPS provides one-touch setup. In addition, you get a 1m USB extension cable packed into the box so that you're able to find the best signal possible.
Where to get it: BroadbandBuyer.co.uk (**bit.ly/1wUQTP5**)

Deal 4: Asus USB-AC53
RRP: £56/ Deal Price: £48

It's relatively expensive compare to some of the other adaptors here, but getting the Asus USB-AC53 for under £50 is a good deal, given its pedigree. The internal patch antennae offer wide coverage, while Asus' NetClip software helps you locate optimum positioning. This adaptor even comes with a cabled cradle so that you doesn't stick inconveniently out of a USB port, and you can position it independently of your system. The best Wireless AC USB adaptor you'll find, bar none.
Where to get it: Dabs (**bit.ly/1u26Yaj**)

Deal 5: Asus PCE-AC68
RRP: £80 / Deal Price: £63

If you want a high-quality PCI network adaptor with Wireless AC support, you'll have to be prepared to pay. Wireless AC isn't cheap, and the size of the heatsink on the Asus PCE-AC68 should clue you in as to why. There's a lot of power in there – but its triple antennae design gives it throughput of up to 1.3Gbps, and there's a detachable magnetic base so that you can move the aerials for better reception. An essential piece of kit for those serious about their networking.
Where to get it: eBuyer (**bit.ly/1yflkkP**)

Yelp Restaurant Doubles Discount

One-star reviews still sought after

Teens' Gizmo Records TV When You Nod Off

Doesn't mop up drool, unfortunately...

Congratulations are in order to teens Ryan Oliver and Jonathan Kingsley, 15 and 14-years-old respectively, who successfully teamed up with Virgin Media as part of its Switched on Futures initiative.

The pair helped to develop KipstR, wearable technology helping sleeping beauties from missing out on their televisual pleasures by automatically setting TiVo boxes to record whatever is on TV at the time should they fall asleep in front of the box. The pair were commissioned by Virgin Media to develop the 3D printed wristband which uses a pulse-oximeter (no, we've never heard of that before either) to sense if the wearer is asleep or awake. Said pulse-oximeter then goes on to mimic the user's TiVo remote control to pause, record or resume a show appropriately.

Naturally, the lads jumped at the chance to take part in this project, and fair play to them for helping out on this, although it does rather suggest that society had become rather more dependent on TV than we're comfortable with.

QUICK BITS... More than 30 billion WhatsApp messages are sent every day according to the company's CEO, with 700 million

You may remember reading about a story last year about an Italian restaurant in California that was handing out a 25% discount to anyone posting one-star reviews of their dining experiences on Yelp. The idea behind this was a reaction to Yelp's aggressive advertising tactics – it alleged that Yelp was asking for money from businesses listed in preferential positions on the site, so the restaurant's owners saw this as a way of mocking the whole system.

Now, it's decided to offer anyone writing a one-star review double the money with a 50% discount. According to web reports, this relates to a Court ruling in favour of what it called "hard bargaining" from Yelp, rather than anything more sinister.

Power to the, erm... pizza people.

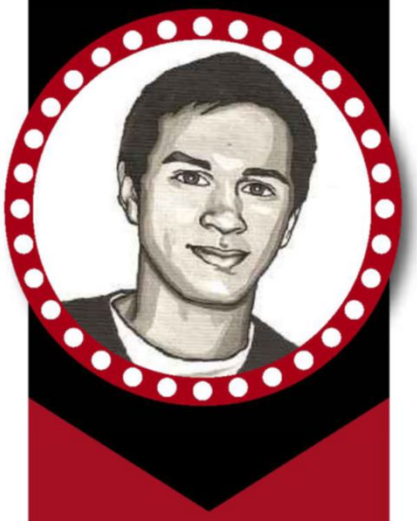
Extend Your Wi-fi Coverage With Ease!

New powerline kit from TP-Link

Oh, we do love a good Powerline kit here at *MM* Towers. This particular one comes courtesy of the good house of TP-Link, and the TL-WPA4230P AV500 Passthrough Powerline WiFi Kit (phew, bit of a mouthful!) does pretty much exactly what you'd expect, extending your web connection to every single room in the house, using your home's electrics.

Among its key features is the promise of high-speed data transfer rates of up to 500Mbps on a line length of up to 300 metres, and with wireless speeds of up to 300Mbps this is a decent solution for any among you looking to connect network compatible devices around the home. Also, the TL-WPA4230P includes a WiFi Clone button, automatically copying the SSID and password of your router, simplifying your wi-fi setup in doing so.

With multiple Ethernet ports for connecting up more devices, this is definitely worth a look. Visit **uk.tp-link.com** for more details.



A little while ago, I moved house, and I had my Virgin Media broadband transferred to the new address. As part of the process, Virgin also gave me a new router, upgrading me to its latest 'Super Hub'.

To be honest, the trouble I had with the first one made wonder whether the name was some kind of joke, because it wasn't 'super' in the slightest.

Happily, I can say I've had no problems at all with the current model and, as a bonus, I now have AC-class wi-fi instead of just N. The only problem is that nothing I own other than the router itself supports this standard. Oddly, though, my laptop, which uses N-class wi-fi, never downloaded at the maximum speed of my internet connection before, but now it does.

I'm not really sure why this is the case, but it goes to show that even though you might not think a new router will have an impact on your setup, you might be pleasantly surprised. I know I was.

Anthony

Editor

Meanwhile... On The Internet...

Awkward is one way you could descibe the US Central Command (**@CENTCOM**) getting its Twitter account hacked at exactly the same time that President Obama was giving a speach on cyber-security (**tinyurl.com/MotI1346a**), though I'm pretty sure it's a word that would have come embellished with a few other choice additions in any meetings that immediately followed. While those responsible for the security of the account tried to pass off the events as mere cyber-vandalism and not all that important, we're pretty sure it wasn't viewed that way behind closed doors. As Bloomberg's Jordan Robertson put it (**tinyurl.com/MotI1346b**), it was not so much shock-and-awe as "shocking and awful" on the PR front.

Indeed, with things like this and the Sony hack happening with increasing frequency, it's not surprising that the UK and its transatlantic cousins have committed to a series of cyber-wargames to try to up their responses should anything more compromising arise (**tinyurl.com/MotI1346c**). It's also kind of ironic, considering the current number one contender for perpetrator of the attacks could well be from these shores (**tinyurl.com/MotI1346d**) but working out of Syria.

Talking of PR problems, David Cameron is likely to face a few if he goes ahead with his plans to limit the use of encryption within messaging programs (unless government agencies are offered unfettered access, essentially on a whim: **tinyurl.com/MotI1346e**) as a response to the terrorist attacks in Paris recently (should he win the next election). His stance, apart from probably being untenable (**tinyurl.com/MotI1346j**), seems to be part of a wider trend for turning on encryption and services such as the Tor network. It's a shift in spin that sees encryption as a worrying development preventing authorities doing their job of protecting us, rather than facilitators of the privacy some people aspire to maintain.

Further to this, Spanish authorities recently appeared to cite the use of encrypted email – specifically the Seattle-based RiseUp service (**help.riseup.net**) – as evidence against alleged anarchists for non-specific terrorism charges (**tinyurl.com/MotI1346f**). It was a move that was met with condemnation from the Electronic Frontier Foundation (**tinyurl.com/MotI1346g**), which tweeted its anger and linked to a blog from RiseUp, which illuminated the case and made an impassioned plea for privacy to be respected rather than feared, saying it rejects the "Kafka-esque criminalisation of social movements, and the ludicrous and extremely alarming implication that protecting one's internet privacy is tantamount to terrorism" (**tinyurl.com/MotI1346h**).

It's taken a while, and it's been subject to all the legal wranglings and shenanigans that you'd expect, but the trial of Ross Ulbricht – the man US authorities believe was behind the now-infamous Silk Road online drug market – finally got underway last week. As if the case wasn't already catnip to the multitude of online news services that have been following the rise and fall of the site for the last four years, the early proceedings managed to up the ante significantly when Ulbricht's defence team alleged that he had been framed as the kingpin known online as Dread Pirate Roberts by none other than the head honcho of shamed Bitcoin exchange Mt. Gox, Mark Karpeles (**tinyurl.com/MotI1346m**).

The allegation was an online hall of shame mash-up of epic proportions (**tinyurl.com/MotI1346n**) and covered with the kind of wide-eyed, wide-mouthed incredulity that you would perhaps (**tinyurl.com/MotI1346o**) expect – especially considering the circumstances of Ulbricht's arrest (**tinyurl.com/MotI1346p**). Officers were able to handcuff him before he shut his laptop and were thus afforded access to what he was actually looking at online at the time (chat and admin pages directly related to Silk Road) and his browsing history (which revealed Bitcoin stashes and other incriminating evidence). However, the gist of the defence strategy now appears to be that Ulbricht was not *the* Dread Pirate Roberts (DPR), but one of them – and that he was set up by Karpeles, who stood to be a whole lot richer if he could inflate the value of Bitcoin, which Silk Road undoubtedly did in its two-years-and-change lifespan.

As legal curveballs go, this one had everyone in the gallery swinging and missing, especially after a year's worth of dry confrontations based largely on legal technicalities, and it apparently took the prosecution by surprise too. That's surprising, though, as further questioning of investigators revealed that they had long suspected that there was more than one DPR, wondered whether there could have been collusion between the site and Mt. Gox, and had even voiced a belief that Karpeles was involved directly as one of multiple DPRs during correspondence.

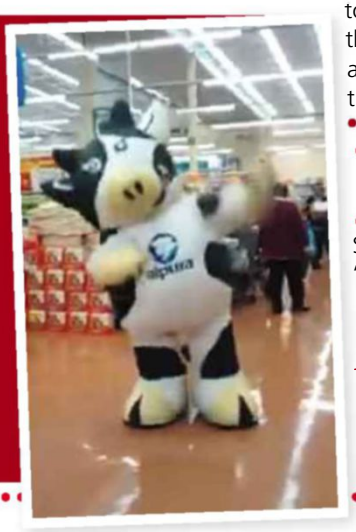
You can bet that this is going to be a big issue over the next year and probably a rumbling issue for debate for a long time to come. Interestingly, though, David Cameron may not find the allies that he expects over the other side of the pond, as US authorities may be keener of cryptography than he thinks (**tinyurl.com/MotI1346i**).

In totally unrelated news, apparently the CIA did nothing wrong when it decided to hack the computers of members of the US Senate investigating claims of torture. So that's fine then – phew (**tinyurl.com/MotI1346k**). 'Pot', 'kettle' and 'black' does spring to mind for some reason.

.AVWhy?

Videos For Your Eyes... Not Necessarily For Your Brain

If you love your job as much as the inhabitant of the cow costume in this video (**tinyurl.com/MotI1346q**), then frankly we envy you. Seriously, there's enjoying what you do and then there's LOVING what you do... And this bovine looks like it goes to work with a whistle every morning...



Aaaaaaaand Finally...

A lovingly rendered 16-bit version of *Guardians Of The Galaxy*, anyone? Yeah, thought so (**tinyurl.com/MotI1346r**)...

QUICK BITS... During the first week in January, Apple announced a new record for billings from the App Store as customers spent

Caption Competition

This lady's tablet issues were the subject of our competition back in issue 1346, and you captioned admirably:

Wyliecoyoteuk: "June thought that the new weather app was a little OTT."
JayCeeDee: "Sylvie soon realised she shouldn't have used the cloud to archive her 'Fit Fireman' photo collection!"
Dwynnehugh: "The new Crap Cleaner is not only vicious, it also cleans anything in the immediate vicinity."
The Duke: "Zeus: the app."
PlaneMan: "The reason flash was dropped from Android."
Nadine Wood: "Explosive new technology being dropped from the market due to complaints of eye trauma."
Nadine Wood: "Flash player just wouldn't adapt to tablets."
Thomas Turnbull: "Wow! This Flash update seems a bit over the top."
Thomas Turnbull: "This is certainly a Hotmail"
Peter Hopkins: "I've never heard Siri say *that* before."
Wyliecoyoteuk: "The new iPad3D"

Thanks for all your entries, but the winner was forum regular Wyliecoyoteuk, who came up with "So that's what 'God Mode' means!"

To enter this week, head to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**) and say something funny (but not too rude) about the picture below or email us via **caption@micromart.co.uk**.

Universal Sues Over Mixtapes For Prisoners

Say whaaaaat?

Universal, something of a major player in the music industry, has decided to sue a group of firms that have been putting together mixtapes for prisoners in the States.

Copyright is all too predictably the issue at work here, but and to fill you in on how this system works: prisoners are given mixtapes with artists including Eminem and Stevie Wonder as part of a package that is distributed to correctional facilities, which also includes toiletries and such like. According to the firms behind the tapes, they help to stop contraband, but Universal isn't having any of it, seeking for damages of $150,000 for every song infringed on.

The lawsuit states the "so-called 'mixtapes,' unless authorised by the copyright owner or owner... are nothing more than collections of infringing, piratical compilations of copyrighted or otherwise legally protected sound recordings and copyrighted musical composition."

Universal obviously has a point here, but this isn't exactly great PR for an industry dogged with copyright claims and counterclaims, is it? In other legal action news...

Dre Sued By Former Beats Business Partner

Range's co-designer feels "betrayed"

Dr Dre is worth a fair bit of money. Quite a lot of money as it happens, especially following Apple's acquisition of Beats Music for $3 billion. Thing is, with all that wealth, others likely want a slice of the action. Enter another lawsuit!

Noel Lee owns the company Monster, which helped to launch Beats by Dre back in 2008. He is suing both Dr Dre and fellow Beats executive Jimmy Iovine with a claim that he lost millions of dollars after the pair "took control" of Beats via what is described in the lawsuit as a "sham" transaction. His legal papers also claim Dre was barely involved in creating the headphones his name is so associated with, and that the original sale of Beats to HTC back in 2012 (where HTC later sold its shares back to Beats), was fraudulent and effectively a move intended to shift ownership away from him and to his former business partners.

Keeping up with all this? We're glad we're not lawyers, to be frank. Too confusing. Anyway, the case very much continues.

nearly half a billion dollars

Snippets!

ICT 'Most Important' School Subject

An interesting bit of research, carried out by our friends at Crucial, has revealed that over two thirds of Brits believe learning how to use computers is more important than Maths and English. Yes, ICT has shot to the top of the list with the popularity of coding, gaming and programming leading those surveyed to list it as the most important subject for future generations.

Truth be told, knowing how to fix a slow computer or diagnose a hardware problem have become skills for life in this ever-changing world, and over 80% of those surveyed believe it's important for kids to learn ICT skills at school.

Ah, ICT teaching. Who else remembers when that meant getting to know a BBC Micro?

Seven-figure Superfast

The UK government is boasting that its rollout of superfast broadband has hit a fine target, reaching over a million homes and businesses across the UK. A huge amount of money has gone into this, of course, with £1.7 billion earmarked for eventually bringing the facility to 95% of UK homes and businesses by 2017.

Apparently, up to 40,000 premises are gaining access to mega-fast broadband a week, which is great. Let's just hope that rural areas are not forgotten about in the race to broadband nirvana.

CPUs > Friends

You may be skeptical of this one, but an experiment has suggested that computers are better at predicting our personalities than real-life friends and family. A computer model analysed Facebook Likes and attempted to work out the user's character based on five key traits. Turns out that the model did a better job than human counterparts. Who knew? Of course, personalities are rather more complex this, but it's an interesting experiment all the same.

One Charger To (Wirelessly) Rule Them All?

Industry groups merge

While news of a potential means of wirelessly charging gadgets is hardly stuff to make you jump off your chair in giddy anticipation, it is potentially important that a couple of separate industry groups championing such technology have now teamed up.

Someone should call Monty Python because the Alliance for Wireless Power (seriously?) and the Power Matters Alliance (oh, now that's just ridiculous now) have signed an agreement to form the League Of Super Powers (okay, so the name is a lie, but the alliance bit is true) and represent big hitters within the industry: Intel, Samsung, LG and Huawei, to name but a few. The hope is to make concerted efforts to bring a standard wireless charging technology to the masses, a state of affairs preferable to a bunch of competing ones, frankly. While this isn't thrilling news, it is quite important, then.

The thrilling world of chargers!

No More Disclaimers!

MP takes a stand

MPs are regularly under fire for winding up the general public about... well, take your pick. However, Sir Alan Duncan may have touched a nerve dear to many of your hearts by suggesting that "useless" legal disclaimers found at the bottom of emails should be laid to rest.

His argument, and it's a pretty sound one, goes that the "meaningless missives" are leading to a bunch of emails being printed out as a result that are ultimately leading to much, much waste of paper. He's so against these disclaimers in fact that he has put forward a bill to ban public bodies from using them.

His suggestion for dealing with this is to replace the print with a hyperlink and we actually think that he may have hit on something here. Let's sit and wait to see what happens with this, if indeed anything does.

QUICK BITS... Google Translate is adding real-time voice translation via its mobile device app

Facebook Finds Hiker

Social media saves injured chap

When Ryan Pritchard went for a walk one Sunday afternoon with his sons, he slipped on a rock and fell some 150 feet down a cliff. Landing in a tree, it's fair to say that Ryan was in something of a predicament.

One of the sons called 911 for help, but was disconnected before he could give an accurate location, with further attempts to call failing. At this point, step forward the local County Sheriff's Department, with dispatchers working on the information to hand to locate Ryan, with his mobile co-ordinates linking to a cell tower. Great, although that was 30 miles from where he was.

And so, in the midst of all this, a despatch trainee Googled Ryan's name, finding his Facebook page as a result. Guess what was on there? A photo, taken from the hike that morning. Genius! Authorities alerted as to his rough location, Ryan was saved from worse injuries and all was good with the world again. The moral? Take photos of everything you do, or something like that.

Microsoft Not Happy With Google

Angry over airing of security flaw in Windows

Microsoft and Google have had a bit of a spat over the reporting of a security flaw in Windows, with Microsoft arguing that it could have placed users at risk. Google first reported on the flaw before a patch had been released to fix the problem and Microsoft has reacted with a lot of anger. Google took its own action as part of its Project Zero initiative, in which it's looking to pressure firms on dealing with security problems in more promptly than they have previously.

Some developers have also reacted angrily over Google's actions and, with Microsoft having asked Google to hang back until it patched the problem, its argument goes that it wanted to protect its customers first. Via a blog post, it added that "What's right for Google is not always right for customers. We urge Google to make protection of customers our collective primary goal."

Poker-Playing Program Promises To Win All The Time

Canada University researchers want participants

A group of researchers at the University of Alberta have come up with what is claimed to be the absolute perfect poker-playing program. The Cepheus software has been taught to play a version of Texas Hold 'em and has been trained in the fine art of card games by playing against itself, taking on over a billion, billion hands of poker. This training took place over just a couple of months – as it uses over 4,000 CPUs, with each one looking at over six billion hands a second. What this means, according to one of the researcher's involved, is that the program has played more poker than the entire human race.

It should be pretty good at it then, right? Apparently so, and its efforts can apparently ultimately be studied to help improve game theory algorithms and build smarter computer systems too. If you'd like to try to beat it for yourself, you can do just that at the Cepheus website, **poker.srv.ualberta.ca**.

The Best & Worst Of CES 2015

We take a look at what this year's big technology expo had to offer

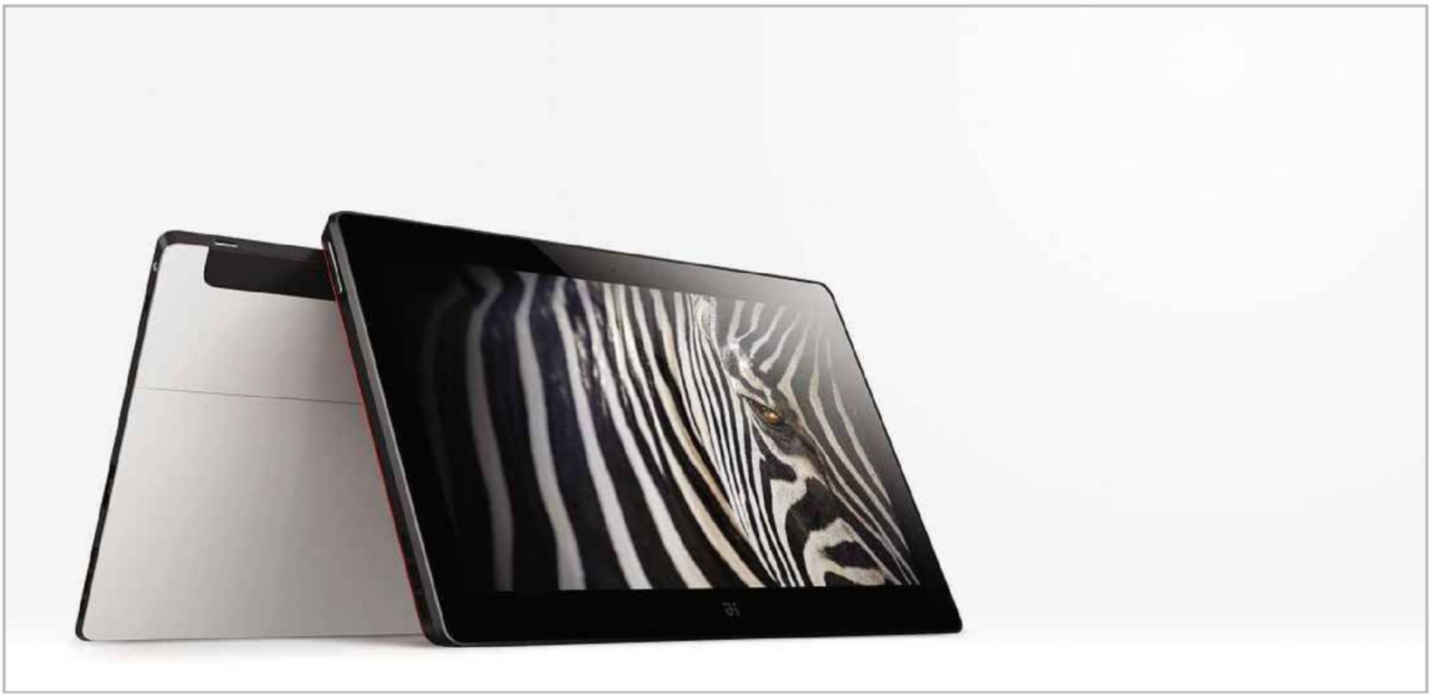
For the 17th time in a row, CES 2015 has rung in the Las Vegas New Year with a slew of technology announcements that should have all serious gadget fans salivating directly into their opening wallets. But which announcements are the real deal, and which are just desperate attempts to attract investment? Trade shows always have two sides: one, a celebration of what the industry can do to make life better for individual consumers, and the other, a mad dash for companies to appear more forward-thinking and future-proof than their competitors.

To help give you a clearer picture of the news coming out of CES, we've taken it upon ourselves to sort the wheat from the chaff in this round-up of CES 2015 announcements. The highlights. The lowlights. When – and if – you'll see these products, and how much you can expect to pay.

Tablets

Ever since the launch of the iPad, tablets have been a big deal at CES. Even though Apple doesn't even turn up for the party, its presence casts a long shadow over the proceedings. That said, CES 2015 has seen something of a slowdown in the number of tablets on offer. Windows hardware is on the rise thanks to lowering prices, which is giving Android devotees some cause for concern, but primarily the big manufacturers – Sony, Samsung, Microsoft and the like – are choosing to showcase their flagship products at individual press shows where the announcements can't get lost. Here are just a few of the devices that launched at CES this year.

One of the new and impressive devices powered by the Intel Core M, the Asus Transformer Book T300 Chi is a Windows-based tablet that's very thin and light by the standards of a 12.5" convertible



tablet – 730kg and 4.3mm thick, which is thinner than a MacBook Air. As with most Transformers, it's operating on the productivity end of the spectrum, with up to 8GB of RAM, up to 128GB of storage and screen resolutions up to 2560 x 1440. All versions feature 802.11ac wi-fi and a 2MP front-facing camera. Pricing for the line starts at $699, though the model described here goes for $799, but no UK pricing has been released yet.

"Which announcements are the real deal, and which are just desperate attempts to attract investment?"

Asus also had several other tablets to reveal, including the Asus Transformer Book T100 Chi, which is a 10.1" model powered by the Intel Atom with a 1920 x 1200 display, up to 64GB of storage and the added bonus of a 5MP rear camera. It costs $399, although again no UK release date or pricing is available. And finally, there was the Asus Transformer Book T90 Chi ($299), which has identical specs to the T100 but comes with a smaller 8.9" screen, a stylus for input and a simpler magnetic docking hinge. It's hard to imagine both of these existing alongside one another given their similarities in pricing and functionality, but it remains to be seen which will live and which will die.

Lenovo is also expanding its convertible tablet line with the Lenovo Yoga Tab 2 with AnyPen. The AnyPen feature is the device's big selling point, allowing you to use any sufficiently conductive object as input, whether that's a pen, something out of the toolbox or a piece of food. Its tempered glass screen means you don't even have to be particularly gentle (Lenovo demonstrated the feature using a fork), and as long as you're not actively trying to harm the screen, it shouldn't scratch at all. Given the market, it seems odd to base your new hardware around a feature that many people are eager to leave in the past, but maybe it's a niche that can be mined.

Aside from featuring the Yoga's trademark foldable design, the rest of the hardware is fairly standard: 8" 1920 x 1200 screen, 2GB RAM, Atom processor and 32GB of SD expandable storage. Like other Yoga tablets, it runs Windows. There's also a 10" variant, which incorporates a subwoofer but no AnyPen features. It's due for release later this month and costs $299 in the US.

Away from big-name hardware manufacturers, the Jide Remix Ultra is a tablet from a US start-up founded by former Google engineers. Its tablet runs Remix OS, which is a customised version of Android that looks and feels a bit more like Windows, with a taskbar and multi-window interface. Taking on Microsoft is very much the device's modus operandi, because the tablet even has a Surface-style kickstand. Other features include a micro-USB port with full-size USB adaptor, SD slot, 2GB of RAM, 5MP rear camera

and an 11.6" 1080p display. The Jide Remix Ultra will be available in the US and UK in the next three to six months, and US pricing is $349 for a 16GB version and $449 for a 64GB version.

If our mention of a 20" tablet sounded ridiculous to you, what about a 65" tablet – because that's what the Fuhu Nabi Big Tab XL is. If phablets blur the lines between phones and tablets, what do we call something that blurs the line between tablet and TV? At first glance you might think it's a smart TV, but it runs on Android and has a full-panel touchscreen like a tablet. Admittedly Fuhu is aiming at the TV market, which is why you'll be able to buy it in 32", 43" and 55" models, but while the form factor is solidly TV, the specs are decidedly tablet: a UHD 4K screen, 2.3GHz Nvidia Tegra X1, 4GB RAM and Android 5.0. There are no pricing details yet, but it's due on the market in Q4 this year.

PCs & Laptops

Tablets might have become the star attraction for the last few CES shows, but that doesn't mean manufacturers have stopped bringing PCs altogether. In many cases the new devices seen at CES are refreshes of old lines, but that doesn't mean there aren't some surprises in store.

One small surprise is the new Acer V17 Nitro, a gaming laptop that features a RealSense 3D camera system designed by Intel. As well as a standard camera, the system incorporates an infra-red camera and laser pointer to allows it to respond to head and hand movements for touch-free input. It can also create 3D models using its 3D scanning abilities. As well as that, the laptop includes four speakers to provide a surround-style experience, and the specs include a Haswell Core i7, GeForce GTX860M, 16GB of memory and up to 256GB of SSD storage. No pricing has been released, but the hardware is due for release in January and is likely to delight gamers eager for some new gimmicks.

Acer also debuted the industry's largest-ever Chromebook, the Acer Chromebook 15, which is powered by a Broadwell Intel Core i3 and has up to 4GB of RAM, up to 32GB of SSD, as well as all other standard Chrombook features (a USB 3.0 port, Bluetooth/wi-fi, HDMI-out and built-in webcam). It's also available at the end of this month with a US price of $249, so think £180+ for the UK price.

At similarly extreme ends of the spectrum, Dell claims that the new Dell XPS 13 is the smallest 13" laptop on the planet, and its smallest-ever 5.2mm bezel 'Infinity Screen' certainly suggests it bears the weight of that claim. It includes some nice touches, like a 13" 3200 x 1800 screen, aluminium exterior and palm rests on the super-light carbon fibre keyboard. Overall, it's just 15mm at its thickest point and weighs 1.18kg if you get the non-touchscreen version. Configurations start at Broadwell Core i3, with 4GB of RAM or more, and up to 512GB of SSD storage, and all configurations support Wireless AC. It goes on sale on 20th January in the UK and starts at £1,099 for the simplest version.

Lenovo had no shortage of devices to show off, so while we can't cover them all, we can at least look at the most interesting.

To start with, the Lenovo LaVie Z is a laptop built around being as light as possible, with an exterior made of a specially developed magnesium-lithium alloy that's 50% lighter than aluminium. Indeed, it's almost as light as an iPad Air. It's powered by a Broadwell Core i5, 4GB of RAM and a 128GB SSD drive. It also has dual USB 3.0 ports, HDMI-out, an SD card reader, Wireless AC, a 720p webcam and a 13.3" full HD screen, so despite the super-thin frame, there's a lot packed in there. That said, there is one drawback: because it's made by NEC, it doesn't feature either Lenovo's trademark AccuType or Precision keyboards, which could be a deal-breaker for Lenovo fans. Other spec versions are available, and it's due out this May priced $1,299 in the US.

The Lenovo Flex 3 has also been given a new design, which made its debut at CES, incorporating a new hinge that gives it the same 360-degree foldable capabilities as the Lenovo Yoga, with the main difference that it's a cheaper entry-level device rather than a high-end laptop. They keyboard isn't removable, but it's available in 11", 14" and 15" sizes, and the new hinge allows them to be held and operated in tablet mode. Although the emphasis is on being cheaper than the Yoga, the larger form factors do come in Core i7

models, while the 11" version is restricted to a Pentium chip at best. Unfortunately there's no resolution upgrade, though; the 11" ones are, somewhat underwhelmingly, fixed at 1366 x 768, while the two larger forms can be upgraded to 1080p at most. US pricing starts at $399 for the 11" Yoga 3, $549 for the 14" model and $579 for the 15" model, and you can expect UK pricing to be more or less equivalent. Either way, all three will be on sale in May.

One interesting release in terms of more standard systems is Origin PC's new gaming laptop, the Origin Eon 17-X, which puts a full-power desktop CPU inside a notebook body, alongside the most powerful mobile graphics card on sale right now, the Nvidia GeForce GTX 980M. Although this isn't the first time it's been done, the Eon 17-X is almost half as thin as most laptops in this class, thanks to a special bespoke chassis (most gaming laptops are retrofitted into standard shells). The laptop starts at around $1,800 in the US and can house anything up to the Core i7-4790K. Its sister device, the Origin Eon 15-X is a little more conventional in that it uses standard mobile CPUs, and it's worth noting that the

"Ever since the launch of the iPad, tablets have been a big deal at CES"

Origin Omega, which made an appearance at CES 2014 under the Steam Machine category, has returned this year in a new HTPC-sized case, running Windows and due for release towards the latter half of the year.

About as far from a standard PC as you can get, the Intel Compute Stick is ostensibly a Windows 8 PC that fits in a case not much bigger than a Chromecast. In practice, it's more like tablet hardware without a screen, but it's hard to deny how impressive it is to have a Windows computer in your pocket. Plug it into any HDMI port and combine it with Bluetooth mouse and keyboard and a wi-fi signal, and essentially, you've got a working computer wherever you are. Hardware includes an Intel Atom Z3735F, 2GB of RAM, 32GB SSD storage, a micro-SD slot, Wireless N connectivity and a full-size USB port. It will retail in the US for $149, and there's a cheaper Linux version with half the RAM for $89. They're both launching later in the year.

Along similar lines, the HP Stream Mini is a $180 portable PC that will be on sale in the US even by the time you read this. 2GB of RAM and 32GB of SSD storage with an Intel Celeron chip allows you to run Windows on any HDMI-compatible screen. If you want better hardware, the $320 HP Pavilion Mini has a better CPU, 4GB of RAM and a considerably more substantial 500GB of SSD storage. Both

devices have a pair of USB ports on the front with an HDMI port and audio jack on the back, and come with a keyboard and mouse, which require an RF dongle (also included). Interestingly, both devices can be opened and upgraded, so they might become interesting toys for hardware tinkerer's trying to squeeze high-end hardware into a small shell.

Wearables

If CES 2014 was the year of wearables, CES 2015 might be the year of wearables that have actually had some thought put into them, although how much thought anyone puts into a watch you have to charge every day is admittedly up for debate. Despite that, the wearables market is starting to mature, so it's a safe bet that some of these devices are going to become staples in your life even if they look like gimmicks now.

Although Alcatel is better-known as a maker of budget smartphones, the company has also moved into the watch business with the Alcatel Smart Watch. Aimed at entry-level consumers, the watch is designed to be small, simple and affordable, with a rubber strap and a circular design influenced by the Moto 360. Hardware wise, it's got a step tracker and heart rate monitor, and there's a USB charge point hidden in the strap's seating (it lasts three to five days on a single charge). As for software, it has 14 preinstalled apps of its own, and while you can't add more, it does connect to an Android or iOS helper app so that you tweak its settings. The device is expected to cost $150 in the US, so it's still far from cheap, but it is likely to be one of the cheapest around when it's released and may be the right entry-level device for curious consumers.

If that's the cheap watch, the Sony SmartWatch 3 Steel is the opposite of that. It's a new Android-based SmartWatch from Sony,

or rather it's the firm's old SmartWatch 3 but with a steel rather than rubber strap, for added aesthetic and stylistic value. Although it's a purely cosmetic change, it does give new life to the device, repositioning it at the super-high end of hardware. And it's worth remembering that it still has its own GPS functionality, so it's possible to use it to track runs and routes even if you don't have your phone on you. Due out worldwide in February, but pricing is yet to be confirmed – although given that the price of the regular Sony SmartWatch 3 is £190, we'd definitely expect something north of £200.

"What really gets people excited at CES are the off-the-wall ideas"

If you like fitness tracking but not smart watches, the Lenovo Vibe Band VB10 sees Lenovo moving into the wearables market with its super-cheap ($89 in the US) smart fitness tracker, which is essentially a fitness band with some very limited smartwatch-like functions thanks to its 1.43" screen. Although it's an entry-level device, it has an IPX7 waterproof rating, a week's battery life and the ability to track steps, distance, sleep cycles and calories burned, as well as deliver notifications for calls, texts, Facebook, Twitter and chat apps. And how does it achieve that functionality on such low pricing? Well, the monochrome E Ink screen is obviously a world away from colour LCD smartwatches, and although its casing looks like metal, it's actually plastic. It's definitely a casual piece of hardware, but it should find a market in people who want something a bit more sophisticated than their FitBit.

And just in case there's any doubt that manufacturers have gone wearable crazy, Garmin has used CES 2015 to launch not one, not two, but three entirely new smartwatches with vastly different forms and capabilities (and that's in addition to a new, though largely uninteresting fitness band, the VivoFit 2).

The cheapest watch, the Garmin VivoActive, retails for $250 or $300 with a heart rate monitor bundled in, and it's due out at the end of this quarter. Available in black or white with a silicone or leather band, it has a square, colour LCD touchscreen that shows smartphone notifications and has access to its own ConnectQI app market. The watch also has its own GPS (which you'd expect from Garmin) and is waterproof up to 50 metres. It even has a vibration system built-in.

A step up, the Garmin Fenix 3 is a rugged smartwatch aimed at more active customers. Also due out in Q1, the US retail price is $500 for the basic model, $550 for the version with a heart rate monitor or $600 for a version with a significantly more durable sapphire screen and stainless steel band. Functionality is similar to the VivoActive, except that it's waterproof at up to 100 metres and has a special ski/boarding mode for tracking different types of workout, as well as a compass, barometer and altimeter. It's also worth noting that unlike its predecessor, the Fenix 2, it does have a colour LCD screen.

And if you're after a more specialist device, the Garmin Epix smartwatch is a multi-sport device that comes with 8GB of on-board storage, a variety of preloaded maps so you can use it to navigate offline and a battery saving mode that doubles its charge time to 50 hours (though we're not sure what it does that means it couldn't be enabled all the time. Again, due this quarter, the basic model is set at $550, but there are no heart monitor or sapphire screen versions. Arguably, that's one watch too far, but at least you can't accuse Garmin of playing it safe.

Other Gadgets

As good as the conventional releases are, what really gets people excited at CES are the off-the-wall ideas that will either inspire a new generation of devices the following year or, more likely, disappear into obscurity – if they ever make it to market at all. Here are some of the best and worst examples from this year's show, but we'll leave it up to you to decide which category they fit in.

For a while, 'cameraphone' meant any phone with a camera. But now all phones have cameras, so when someone says 'cameraphone', you might think of something like the Panasonic Lumix CM1, which is a smartphone that's also a camera, rather than having a camera inside it. If that's not clear, the fact that it takes 20MP images and has a retractable 28mm Leica lens should give you some idea of what to expect. Inside there's a professional-quality 1" sensor that can capture in RAW mode. Panasonic is keen to stress the camera aspect, describing it as a 'communication camera', because instead of a standard screen, it has a 4.7", 1920 x 1080 touchscreen running Android 4.4.4 on a 2.3GHz processor. If this intrigues you, good news: limited quantities are available in the UK right now, priced £799.

Sony, meanwhile, is getting back in on the portable music game that it basically invented in the 1980s with yet another Walkman, although in this case it's the Sony Walkman NWZ-ZX2. It costs over $1,000 in the US and sits in a carved aluminium case, with 128GB of storage and space for a micro-SD card too. It runs Android 4.2, so you can use streaming apps with it, and it has dual-band wireless connectivity to keep streams free from stutter. Inside, it has Sony's high-quality S-Master HX digital amplifier and support for lossless audio. Whether anyone needs a high-resolution audio device that's also portable isn't certain, but let's see how this does. It's certainly not the first – just the first from a big name manufacturer. Due April this year.

Sticking with the audio theme, Google announced the Google Cast for Audio, which is an attempt to take on AirPlay, providing

a technology that can link up a network of speakers around your home to transmit audio from any number of streaming services and can even be controlled by an Android or iOS app. However, it doesn't support Spotify at the moment, which is a brave omission. The main speaker handles the streaming, so your phone battery is safe, but you'll have to wait until the first supporting speakers are released later in the year to give it a try. But as a reference point, the cheapest announced speaker is the HEOS 3, which retails for $299 in the US, so it probably won't be cheap.

Finally, if you thought that streaming media TV hardware was over, think again: the Razer Forge Android TV Box is a $100 device aimed at gamers (and for $150 you get a Bluetooth controller too), which lets you play Android games on your TV (2GB RAM, 16GB SSD and a Snapdragon 805/Adreno 420 processor combo). But more importantly, it has a built-in technology called 'Cortex: Stream', which allows you to use its Wireless AC capabilities to create a low-latency stream from your PC, meaning you can cast video and games from your main system to your TV. Combine with Razer's Bluetooth mice and keyboards (naturally) for a fully featured PC gaming experience in your living room.

So that's the good stuff from CES 2015 – though as usual there's far more coming out than we could hope to cover in depth. CES has a long history of successful consumer electronics debuts, so if you want to play a game, try to imagine whether any of these will be the next VCR (CES 1970) and which will be the next Laserdisc player (CES 1974). Same time next year? **mm**

Officejet Pro 8620

Michael checks out a new HP all-in-one device

DETAILS
- **Price: £170 (Ebuyer)**
- **Manufacturer: HP**
- **Website: tinyurl.com/kgxbs7k**
- **Required Spec: Pentium II with 750MB of hard disk space running Windows XP SP3 and later or Mac OS X 10 with 1GB of hard disk space**

The HP Officejet Pro 8620 is an all-in-one device that offers print, scan, copy and fax capabilities. It also provides automatic document feed (ADF) and duplex print facilities with a choice of wired, wireless or USB connectivity. The product follows the basic layout principle of a layered approach, consisting of a paper input/output module supporting the four-cartridge (black, cyan, magenta and yellow) inkjet printer which in turn supports an A4 flatbed scanner topped off by the ADF feature. This arrangement produces a device with dimensions of 499.3 x 468 x 314mm including the Duplex module which slots into the rear of the unit.

Protruding from the front of the unit is the paper input tray with a capacity of 250 sheets. A pull-out extension platform on the top of the paper tray acts as a support for printed documents (150 sheet capacity). To the left of this is a USB port for attaching a flash stick holding content for printing. Positioned on the front of the printer unit is a touch-sensitive, colour control panel. This features options for the main copy, scan, print and fax tasks plus buttons for Home, Back and Help. The panel can be adjusted to various angles to best suit your viewing position.

Situated next to the control panel is a lacquered area featuring the unit's NFC facility. Touch this area with a smartphone or tablet containing the relevant app and you can send content to the printer.

> **"It managed 28ppm in Draft mode, dropping down to 10ppm in Best"**

The A4 flatbed scanner, with a resolution of 1200 x 1200dpi, can operate in standalone mode with images being sent to a computer or in conjunction with the printer when operating in photocopy mode. Sitting on top of the scanner is the ADF module, which can feed up to 50 sheets through the scanner and printer for producing hard copies.

Apart from the front-mounted USB port, all the main connections are tucked away at the rear of the unit. There are sockets for power, Ethernet, USB and phone line connection plus the opening for slotting in the Duplex module.

Drivers for print, scanner and fax are provided on the supplied CD which also contains a general set-up wizard for the fax feature. This particular aspect supports auto redial, delayed sending and message forwarding. You also get a copy of the IRIS OCR software.

The print driver offers a choice of Draft, Normal and Best Quality options that include borderless prints, eco mode and Duplex printing. Using my standard 101-word document it managed 28ppm in Draft, droping to 10ppm in Best. Further tests saw a 10-page (5550 word) document produced on five pages with Duplex printing turned on in 58 seconds while five pages fed through the ADF were photocopied in 37 seconds. A single scan and print operation took 14 seconds. Switching to printing photo images revealed that there was a speed difference when the sourcing images from a computer or flash stick, the former beting quicker than the latter.

Replacement high yield inkjet cartridges are priced £25 for black and £18 for each colour. A value pack, containing the three colours, is priced £52.

mm Michael Fereday

A well-specified small office All-in-One

Officejet Pro 8620	
Draft	28ppm
Normal	25ppm
Best	10ppm

Photographic Images		
	Stored on Computer	Stored on Flash Stick
A4	2 min 2 seconds	2 min 21 seconds
10 x 15cm	29 seconds	56 seconds

Devolo dLAN 1200+WiFi Starter Kit

Devolo enhances its dLAN 1200+ range with ac class wi-fi

DETAILS
- **Price: £160**
- **Manufacturer: Devolo**
- **Website: www.devolo.com/uk**
- **Required Spec: Wired and/or wireless network**

Didn't Devolo just release a new dLAN 1200+ starter kit? Yes, they did and I reviewed it here not long ago. For those that didn't see that, Devolo delivered some typically well-made hardware, (though I thought the 1200+ speed rating was a slight oversell).

Half of this starter kit is the same MT 2042 dLAN 1200+ adapter, but in this kit it is paired with the new MT2675 adapter that adds wi-fi to its impressive Powerline abilities. What I wasn't prepared for was how much larger the wi-fi enhanced adapter is, because it's huge. Where the standard adapter is 13cm x 6.5cm, its big brother is a whopping 15cm x 7.5cm, though thankfully it's the same 4cm thickness – but because it's got a through power connection, that's much of an issue.

What's more annoying is that Devolo still insists on placing the Ethernet sockets on the top (two of them). I wish it'd stop doing this, because it would look much neater if the connectors were on the bottom, or even the side.

If you can accept this white plastic house brick attached to your wall, then it brings with it some highly desirable features. The wi-fi is rated for 802.11a,b,g,n and ac, covering whatever wi-fi gear that you've already invested in. It's the ac mode that is by far the most interesting of these modes, allowing for the greatest performance for those devices that can access it.

In 802.11ac operation it offers 2x2 MIMO (multiple-input and multiple-output) on both 2.4GHz and 5GHz frequencies, delivering potentially 300Mbps and 867Mbps bandwidth out of each side respectively. This goes some way to explaining the physical size of the adapter, because it contains no less than four antenna to achieve the combined bandwidth in excess of 1300Mbps, though that's a theoretical level that can't realistically be achieved in a typical UK home. That's not a slight on this hardware, just the reality of modern wi-fi.

The major selling point here is that you can use this kit to connect your broadband router with a remote wi-fi access point; not just any access point, mind, but an ac class one that can run at high speed. The only caveat here is the price, being another £40 more than the Powerline-only dLAN 1200+ starter kit.

You can buy the dLAN powerline 1200+ WiFi ac adapter alone, but that's nearly £110, and you'll need its corresponding single adapter that costs £70. Therefore the starter kit saves you £20, unless you've already got dLAN 1200+ hardware handy.

If you want the veritable Rolls and Royce of Powerline wi-fi solutions, this equipment is probably it – though it isn't cheap, and I'd try adjusting the channels your existing wi-fi router uses before spending this much.

If you've got a large house that has shady wi-fi spots, then this kit could be an effective solution for those that like simple installations and high performance.

mm Mark Pickavance

Key Features
- Lightning-fast 1200 Mbp/s powerline connection twinned with wi-fi ac access point
- Simultaneous use of 2.4- and 5GHz wi-fi frequencies for maximum wi-fi speed
- 2x Integrated Gigabit LAN ports
- The integrated sockets also ensure that no power outlet goes to waste
- With the Gigabit LAN connections you can simultaneously connect Internet-compatible devices at any time via network cables to the Internet (e.g. game console or smart TV)

Fast 1200+ Powerline networking now with extra ac wi-fi

Aerocool Dead Silence Red Edition Cube Case

EDITOR'S CHOICE micro mart

A case that's the equivalent of Imperial Leather for the PC

DETAILS

- **Price: £65 via Falcon Computers**
- **Manufacturer: Aerocool**
- **Website: goo.gl/p135eF**
- **Required Spec: Micro-ATX, Mini-ITX motherboard, ATX PSU**

Aerocool is a company that has gone from strength to strength over these past few years. Its initial foray into extreme PC cases, the Aerocool X-Predator X1 was a reasonably good case despite it looking a little blocky these days (and, ironically, suffering from poor cooling).

More recently it's updated its product range, moving on to the far superior looking and performing, Dead Silence models. This Red Edition Cube, a Micro-ATX case that bears the Dead Silence name, has many alluring features – not just for the discerning PC cooling enthusiast, but also for those who fancy having their hardware fitted into a case with a little more style than one is usually accustomed to.

For starters, the finish is an extraordinary leather coated front and top panels (it does come in other colours), with smooth black matt side panels and optional acrylic windows available. The leather exterior offers a far more pleasant look to the case, while also keeping it generally scratch proof and adding (in some small way) to the noise filtering.

The front comes equipped with a single 5.25" drive bay with a single 3.5" bay beneath. Both of these share leathery finish to their fascias and can easily be popped out of the case mounts with the usual clips on either side. To either side of the leather front panel there are a pair of indented sections that provide ventilation access to the large 200mm/500rpm fan attached the interior front of the case, drawing the air through and over the internal components to be dealt with the rear internally mounted 120mm exhaust fan.

The top of the case has a lot going on. There's a large central panel that can be removed in favour of an included meshed cover for greater airflow, which underneath would sit a set of optional fans. The central panel is easily removed with a sliding latch, and a new panel can be popped into place in a matter of seconds should you ever need to. Along the edges of the top central panel are the power, reset, headphone and mic ports, and on the opposite side are four USB ports (2x USB 2.0 and 2x USB 3.0). It's worth noting as well that the indented ventilation section also runs along the top of the case, as it did on the front panel.

Everything inside the case is rubberised to reduce vibrations and noise levels. The motherboard would lie horizontally across a raised section for maximum airflow, allowing space for a 190mm CPU cooler and full-sized graphics card. The PSU is fitted at the very bottom of the case, with the exhaust fan aiming down through an included dust filter and out through the raised and curved bottom of the chassis.

The drive bays are tool-less, with rubber mounts, while cables can be passed through a series of slots designed to keep everything tidy and to improve the internal airflow. The slots are really well machined, with rounded edges and not a sharp edge in sight; good for cables and fingers! The rear houses a pair of rubber encased holes for an optional water cooling setup. Below this is a shielded, single PCI bracket that will keep everything in its place.

The Aerocool Dead Silence Red Edition Cube is a neat, stylish, and very functional case. There's plenty of room inside for all manner of PC builder, while still being great to look at.

mm David Hayward

Excellent quality, and superb design make this a case worth buying

micro mart
9 Quality
8 Value
9 Overall

TP-Link 300Mbps Wi-fi Range Extender With AC Passthrough

Michael reports on a Wi-Fi booster.

DETAILS
- **Price: £32**
- **Manufacturer: TP-Link**
- **Website: www.tp-link.com**
- **Required Spec: Wi-fi network**

You're probably well aware of where the hot and dead spots are in your home wi-fi network are. Attempting to increase the former and decrease the latter can be a frustrating experience as you move kit around to get the best results. Offering to help in this respect is the 300Mbps Wi-Fi Range Extender with AC Passthrough capabilities from TP-Link.

This product consists of the Range Extender unit, Ethernet cable, mini CD and Quick Start leaflet. The Range Extender unit, with dimensions of 110 x 65.8 x 75.2mm, has the overall appearance of a three-pin, white power adapter. Attached to the sides of the device is a pair of arms which can be swivelled into various positions for an optimum signal.

Taking over the top section of the Range Extender's front panel is the unit's passthrough feature allowing you to daisy-chain an additional device to the power source being occupied by the Extender. Also on the front of the unit are three LED lights which provide status feedback regarding Signal, Ethernet and System issues. Located on the base of the Extender is an Ethernet port. The positioning of this port is such that you might want to avoid using a skirting-board power socket for mounting this product which could block access to this feature. Buttons for Reset, WPS and Power are located on the right side of the Range Extender.

When configuring this Range Extender for use with your network, the simplest method is through the use of WPS. This just involves slotting the Range Extender into a power socket within reasonable proximity to a router and then pressing the WPS button on the router and Range Extender. Within a minute a connection should be established as the Signal LED progresses through a sequence of flashing green, solid green, flashing orange and solid orange colours.

There is a second method for those who do not have access to WPS. This approach requires more user interaction as the Range Extender is linked to a computer via the Ethernet port and cable. You then need to access the appropriate web site using a browser for entering the necessary information. Instructions are provided for this process in the Quick Start leaflet. Obviously WPS is the preferred option, if available.

In order to gain the full benefits of this Range Extender you will need to reposition it in another location with reconnection being carried out automatically. Due to the layout of my single level flat with my Wi-Fi router positioned in the front room, I often had difficulty in picking up a signal when in my back room. Several intervening walls were the problem. However when the Range Extender was placed at a halfway point, access to my network and wi-fi was quickly established. The product documentation does advice against positioning the Range Extender in the same location as cordless phones, Bluetooth devices or a microwave as these items can interfere with the signal.

Earlier I mentioned that there is an Ethernet port on the Range Extender. This feature can be used, along with the supplied cable, to link a wired device into the wi-fi network. This is convenent for connecting a Blu-ray player or games console, should you wish.

The 300Mbps Range Extender with AC Passthrough is compatible with 802.11b/g/n devices and provides support for 64/128/152-bit WEP, WPA-PSK/WPA2-PSK encryption when boosting your wi-fi signal.

mm Michael Fereday

A straightforward method of boosting your wi-fi signal for those with WPS

Pebble Smartwatch

Kevin Pocock happily ditches the phone clones for a really smart watch

EDITOR'S CHOICE micro mart

DETAILS
- **Price: £99 (via Amazon UK)**
- **Manufacturer: Pebble**
- **Website: www.getpebble.com**
- **Specs: Require**

There's an odd thing about the smartwatch market: it's generally more about about the journey towards a final destination than were we are right now. Ultimately, wrist-borne devices may completely replace smartphones – but in the interim, we have to put up with smartwatches costing as much as our mobile extensions (and offer many of the features), but that aren't as useful as they still need to be synchronised with a smartphone for full functionality.

The Pebble stands apart, though. Not only because of the record-breaking crowdfunding support that helped bring these products to market, but because it provides a perfectly neat solution to a simple issue. It doesn't respond to 'OK Google' commands, it's not touchscreen device, it doesn't have a curved super AMOLED scree, and nor does its battery need daily attention (hurrah). What the Pebble does, is make you aware – it provides instant notifications of texts, email, WhatsApp, Facebook and other direct messages, on your wrist. For example: it tells you who's calling, and then leaves the rest up to you. It's simple, it's straightforward – and this has clear advantages.

Price is obviously one of them. In a market full of smartwatches laden with the latest and greatest advancements in technology and miniturisation, the Pebble's collection of parts is fairly humble. As a result it costs just £99, a price falls directly into this writer's 'very affordable tech' bracket. Yes, not only is this a product fully supported by its public and backed through to production. It's also one that makes itself attractive to a wider technology-interested group by doing what we all like. By providing an effective low-cost solution without unnecessary frills, and without unnecessary pricing - and it's an effective approach.

The Pebble's main attraction is its 144 x 168 Sharp Memory LCD e-Paper display. Clearly unable to match the likes of the Moto 360, or the Samsung and Sony stables for colour or resolution, Pebble's selective functionality means you it simply doesn't need a display that's more illustrious. When reading the time or text, the reversible light/dark monochrome options are all that are required. And because of the display, the battery lasts an almost unimaginable seven days (well... unimaginable to other manufacturers, that is). That seems such a luxury, but it shouldn't be.

The benefit of a smartwatch should be that it sits on your wrist, does its job and is ready only when called upon (or when you're called upon). A good seven days on one charge enables this. There's no constant need to hook it up to a power source, and when it finally

does run low on power, it'll come as a pleasant reminder as to how long its been since the last time. This power efficiency is undoubtedly due to the display, but it's also due to the simple elegance of the Pebble's LED backlight, and the small amount of power used by the device's accelerometer. With little fanciness sucking up power, the Pebble just keeps working. In fact, even when the 20% battery warning is issued, you'll know you've got a good day or more left to play with before it finally fails you.

Of course you can drain the battery quicker. That comes down to whether you make use of any of Pebble's many useful apps. Sticking to its maverick nature, the company doesn't lend support to the Android Wear system. Instead Pebble supports both Android and Apple smartphones with its own 'market' accessed through the Pebble's own app. Health and fitness, travel, productivity, sleep monitoring and even news apps are all available here, with the device allowing eight 'slots' to be filled with your desired programs. These bring even more use to an already incredibly handy gadget, and you can even choose from innumerable digital, analogue (and some plain odd) watchface designs.

> **"It's simple, it's straightforward – and this has clear advantages"**

What else is there to know about this most enticing gadget? Well, it's not much to look at, unless you're a fan of 90s retro-futurism... like me. The Pebble's oblong face may not have you fawning over its aesthetic appeal, but it sits comfortably thanks to its watch-standard adjustable silicone strap. Back, select, up and down buttons make for an intuitive way to navigate the Pebble's neatly ordered menus, but it has one or two other simple attributes to further endear you to it. Firstly it's display is scratch resistant. Secondly it's 5ATM rated, so you can submerge it in up to 40m of fresh or salt water without worrying about an untimely demise. Just as well, because although the smartwatch journey is far from over, I want my own Pebble – the one which sits on my wrist as I type this – to have a fair few more adventures yet.

mm **Kevin Pocock**

Until the future arrives, this is the right smartwatch for right here, right now

Elite: Dangerous

Elite: Dangerous is big. You just won't believe how vastly, hugely, mind-bogglingly big it is...

DETAILS
- **Price: £40**
- **Manufacturer: Frontier Developments**
- **Website: goo.gl/EVIPGq**
- **Required Spec: Quad core 2GHz CPU+, 4GB RAM, GTX260/4870HD+, internet connection**

Outfitting your ship for a particular purpose is key to success

Back in the autumn of1984 a then-younger man (who would, one day, become a mighty *Micro Mart* reviewer) made his way home clutching at what would eventually became the definitive 8-bit game. Priced then at a staggering £15, he would soon come to conclude that *Elite*, which was the game in his eager hands, was all a simulation and strategy gamer could ever ask for. It was huge; it engulfed the player. It would be a part of his life for next thirty-odd years.

The original *Elite* was amazing. Frustrating in many ways, difficult to get to grips with at times, even a little boring at particular moments – but it was amazing, nonetheless. Now, though, we can finally get our hands on the much awaited modern remake of that past masterpiece.

Elite: Dangerous has pushed its way through a lengthy beta process and it's developers, Frontier, have now presented us with a space simulation that hopes to be as mightily impressive as the universe in which it is set.

First and foremost *Elite* is, and always will be, a would-be simulation. If you're thinking of getting behind the controls of a Sidewinder and battling through waves of oncoming, nicely choreographed enemy fighters then you're going to be in for something of a shock. There's little of the arcade here, and even less of the quick five-minute play attraction, either. Indeed, *Dangerous* forces you into a different mind-set, and into a universe that you can mould and make your own impact on, no matter how small an impact that may ultimately end up being.

> **“Not for those who won't appreciate the vast economies and intricate politics”**

Who you want to be in its universe is up to you. Do you trade, mine, hunt down bounties on other pilots? Do you become a smuggler, pirate, hunter and all out galactic rogue of sorts? Do you aligned with any of the three main governments? It's up to you... maybe you're more interested in making money from any one of the thousands of corporation-controlled planetary systems, instead? Who knows? Not I.

Your choice isn't cemented from the start of the game, either. If you've tired of mining nearby asteroids of their minerals, then a quick change of the load-out in the ship – providing you have the funds to do so – can start you on the path of becoming the galaxy's most renowned bounty hunter. The point being, *Dangerous* is immense – and with 400 billion star systems apparently available to explore, visit, hide and manoeuvre around, that choice is one that's forever changing, either through personal taste or through the economics of the sector you're currently inhabiting.

Frontier has managed to capture a sense of awe on a universal scale that you would expect from a space-faring game. Leaving the relative safety of the space station you start from finds you setting off on a journey of graphical wonderment, extreme exhilaration and moments of intense frustration.

Engaging the faster than light engines, Frame Shift Drive into Supercruise mode allows you to zip around the current star system and take in the points of interest. Shifting up, you'll then lock onto a distant star and fire up the Hyperspace drive thus allowing you to travel the many light years that bridge the void between one

You can keep an eye on the rankings through your ships on-board computers

Graphically, Elite: Dangerous is quite outstanding

star and another in a matter of seconds. Once you reach your destination you are dragged out of Hyperspace and thrown toward the system's parent star, which is when you first begin to appreciate the graphical splendour and immensity of the scale of the universe in which your are placed.

There's a special feeling when seeing an alien planet slowly rotate below your ship, and to have the star in which it's locked in the orbital dance with break over the circumference of the world. It really is quite a staggering vista, and one of millions you'll soon come to appreciate and stop to wonder at throughout the course of your space-bound career.

Getting to that point, though, can be a little fraught at times. Controlling your ship takes practise and a re-education in learning how to interact with *Elite*. Those who dally with true to life simulations will probably fare better, and if you're already lucky enough to own one of the many flight simulation sticks and other controls, then you'll certainly have no issues in mapping the roll, pitch, yaw and countless other thruster related details to the hardware. The rest of us however, need to follow the tutorials, read the forums, watch the YouTube clips and practise, practise, practise before we can go it alone and stand a reasonable chance of surviving the inky abyss that's mere inches behind the armour plating of our ships.

Another potential issue is the always-online factor, and just how will these servers be paid for in a few years' time? When the bills are getting too big and the money isn't coming in, will Frontier pull the plug and leave the players stranded alone in the galaxy? It's worth thinking about.

That said, *Dangerous* is one of the most incredible games we've ever played. It's not just the combat with other players, nor is it just the depth of the visible universe you can play in, nor the way in you can become whoever you want. It's *all* of that, and the infinite number of possible encounters, views and cosmic spectacles that makes this not just a game, but an immersive interaction with other like-minded people – some of whom are hell-bent on achieving Elite status, in a universe where virtually anything goes.

Hyperbole aside, *Elite: Dangerous* was an ambitious project, and there's still much that could be done. It's also one that's not for the impatient gamer, or someone who won't appreciate the vast economies and intricate politics that come together to form the Milky Way's governments and denizens. It may not be everyone's cup of tea, but for those who love this particular flavour of tea, it's simply wonderful.

mm David Hayward

An incredible game with unlimited depth, but only for those who can appreciate this kind of simulation

GROUP TEST

Android Consoles

The Android mini-console and media device was set to become the David to the big console Goliath's. However, things never panned out the way the pundits, though.

We still have some great and not so great, Android mini-consoles and media devices, though. David Hayward therefore has been perched in front of a monitor and testing six of them.

Android Consoles

Ouya

DETAILS
- **Price: £85**
- **Manufacturer: Ouya**
- **Website: goo.gl/at6jSM**
- **What's needed: Ouya account, card details**

micro mart
4 Quality
6 Value
4 Overall

And so begins the revolution." These are the first words that greet you when you open up the trendy, glossy packaging of the Ouya. The initial feeling is one of class and that you've picked up the future of gaming consoles, but, unfortunately, you may be let down.

The packaging of the Ouya is one thing, but the actual contents are something quite different. The Ouya is a smart, Rubik's cube sized device with a brushed aluminium and plastic case that is designed to look very attractive sitting next to a TV, not out of place at all with the other mixture of modern appliances. Unfortunately, though, its design is scuppered with the last generation's mid-range tablet technology. While this isn't too much of a problem to most users, the hardcore among you will no doubt feel a little short-changed when comparing the specification with your current phone.

There's enough connectivity to get you up and running: an HDMI port, wi-fi, Ethernet port, power, full-sized USB and a micro-USB port sit at the rear of the unit in a snug fashion that can get a little crowded once loaded up. The power button is on the top of the unit, which emits a soft glow once pressed and feels as sturdy as the rest of the unit.

Next up is the included controller, which despite the much advertised 'from the ground up' modelling, looks like the strange love-child of an Xbox and N64 controller. It's not uncomfortable to use, but there are some serious design flaws.

The four buttons, which spell out O U Y A, feel less than average and have the habit of sticking frequently. The triggers have far too much travel in them, and the D-pad is too 'squishy', but the sticks are decent enough. The batteries for the wireless controller sit within the hand grips, which means you'll have to remove the upper panels to gain access. Normally this isn't too much of an issue, but in this case the plastic feels cheap and when being replaced never seems to fully click into place.

Powering up the Ouya for the first time involves the setup and account creation process – one that includes you having to add a valid debit or credit card, which in our mind is quite unforgivable in this day and age. Refusal to enter such information means you'll be returning the unit to the shop, because you won't be allowed to continue.

Once in, though, you're greeted with a customised Android 4.3 UI, which isn't too bad. The Discover Ouya Store has a decent selection of games and a few apps such as VLC and XBMC, all arranged in tiles and groups. The tiles themselves don't really stand out from the crowd, and although there are one or two notable exceptions that are quite good, the vast majority are pretty dire. Retro console emulation is, however, excellent. With a Sega Mega Drive emulator installed and a collection of games, the Ouya's faults can almost be forgiven

It's not that the Ouya is diabolically bad, it's just that it doesn't deliver what was envisaged. It's ultimately a failed project, but provided you know its limitations, it can be used to good effect.

It may look good, but the Ouya is a flawed device

Despite being redesigned, the controllers aren't that good

Green Throttle

DETAILS
- **Price: ~£17**
- **Manufacturer: Green Throttle Games – Now Google**
- **Website: goo.gl/8Sl2fQ - Amazon store**
- **What's needed: Google account, Green Throttle Arena account – which no longer exists**

The Green Throttle controller was the main interface with the Green Throttle Arena

The entire project has now since died, but these items are still for sale

Coming out at around the same time as the Ouya, the Green Throttle advertised and promised much. But it was only when the public pulled it from the box that they began to realise what they'd gotten themselves in for.

The Green Throttle isn't really a true Android entertainment device as such, at least not in the same way as the Ouya or the other devices on test are. It's a device that essentially comes in three parts: the Atlas controller is the most prominent and resembles pretty much every other game controller you'll see these days. There's a slight design difference between the Green Throttle controller and the Ouya's controller, chiefly the position of the sticks and the design of the D-Pad and buttons. It's reasonably comfortable, but a little too chunky to hold for any great length of time.

The second element is the Green Throttle Arena application, and this is where the device failed initially and still does fail to this day. The Arena is just an app gateway store, which allows the user to pick and choose games and other applications that are credited to work seamlessly with the Green Throttle controller – in other words, without you having to play around with the settings.

> **"Last year, the company that owns Green Throttle gave up"**

To begin with, there were a few games and apps available. After about three months, that number doubled and remained stagnant for many more months after. Last year, the company that owns Green Throttle gave up the ghost and decided to shut the store down, thus leaving the users in the lurch. However, fairly recently – within the last six months of 2014 – Google picked up the remains of the Green Throttle Arena app. What it will eventually do with these assets is so far not known; more than likely it will just sit on the technology.

The third element, which now seems a little superfluous considering the gateway store is no longer available, is simply any Android device that can hook up to a TV and is running anything more recent than version 4.0.3 (Ice Cream Sandwich). The controller is Bluetooth enabled and can connect to the device, thus allowing it to be used as the controller for the games and apps that worked with it.

You may be asking yourselves, then, why we put this in the group test well, but believe it or not, you can actually still buy the Green Throttle – despite the fact that it is essentially a completely failed project.

With that in mind, we thought it prudent to mention this device, given that some unsuspecting buyer may unwittingly fork out for one.

The controller can actually be used as a standard Bluetooth controller, but in all honesty it's really not that good to begin with, and it has the nasty habit of dropping the Bluetooth connection quite regularly.

In short, should you ever come across a Green Throttle device or you're offered one or see one innocently perched on the stall of a car boot sale (we've seen them available), do yourself a huge favour and avoid it at all costs.

Mad Catz M.O.J.O.

DETAILS
- Price: £150
- Manufacturer: Mad Catz
- Website: goo.gl/Jd7NfR
- What's needed: Android/Google account

▲ *The Mad Catz M.O.J.O. is a great Android mini-console*

➤ *There's plenty of potential for rooting and a lot more too*

Android micro-consoles have so far had something of a lukewarm reception, but that could change with the entry of the Mad Catz M.O.J.O., a console device with exceptional hardware and heaps of potential.

Mad Catz is a company renowned for developing extreme-looking products. Its gaming mice and keyboard range have a certain sci-fi quality to them, combined with superb functionality and presentation.

It's fair to say, then, that the M.O.J.O. (which doesn't actually stand for anything) is brimming with the same kind of quality as the rest of the Mad Catz range. To begin with, though, the specifications are more to our liking and reflect exactly what we would come to expect from a micro-media console device.

The quad-core 1.8GHz Nvidia Tegra 4 processor is one of the most powerful we've ever seen in an Android device and, when coupled with 2GB of RAM, the Nvidia GPU side of things does a wonderful job of delivering up to 4K, ultra high-definition visuals. Furthermore, there's 16Gb of built-in flash storage that's augmented with a micro-SD card slot. There's obviously an HDMI output, but there's also a pair of USB ports located on the rear of the unit, one of which is USB 3.0. And finally a 3.5mm headphone port sits alongside an Ethernet port, but there's also 802.11 a/b/g/n wi-fi support too.

The M.O.J.O. is a wedge-shaped, polished black plastic box, with the Mad Catz logo on the angled top and with a power LED located on the front. Along the sides are a set of air vents, with all the relevant cables and so on located on the back, neatly out of sight. It's functional enough, from a design point of view and there's plenty of room for larger USB sticks to fit without making contact with the other connections.

Second to the console itself is the C.T.R.L., a wireless gamepad. The C.T.R.L. doesn't stray too much from the design norms of the modern game controller, but it does add one or two tantalising extras to the mix. For example, along the top of the controller's face you'll find a media player strip, with buttons for play, pause, scan forward and back and volume up and down. There's also a switch on the base, which can change the controller to three different modes. The first is a Smart mode, which will allow the controller to be recognised and work with any of the Mad Catz range. The second mode emulates an mouse, using the analogue sticks and X, Y, A, B buttons. And the third is a PC mode, which allows the controller to work in a more traditional setting as opposed to being an emulated mouse.

To add to the controller points, the M.O.J.O. also comes with a special bracket that clamps onto the controller and offers you a mobile gaming platform for use with your phone.

There's Android 4.2.2 (Jelly Bean) shipped as default, with a Mad Catz GUI front wallpaper and app links on the desktop. Unfortunately, there's no custom GUI, so navigation via the controller can be a little awkward. Therefore a keyboard and mouse are recommended.

Mad Catz is also keen to have you root the device, to make it a more personalised experience. There's plenty of help available, and it's reasonably easy to follow too.

Overall, the M.O.J.O. is a fantastic Android micro-console and media device. It's a tad expensive, but you get a high-quality system for your money.

Nvidia Shield Set

DETAILS
- **Price: £235 Shield Tablet, £50 Shield Controller**
- **Manufacturer: Nvidia**
- **Website: goo.gl/R5KKei**
- **What's needed: Android/Google account, Shield Controller for best results**

The Nvidia Shield Tablet and Controller are quite brilliant, but expensive

Despite the hardware, we found the M.O.J.O. to be slightly faster

micro mart
9 Quality
6 Value
8 Overall

When Nvidia released the US-only Shield device, there was a fair amount of complaining from the rest of the world. When were we going to be able to sample the wonderful handheld goodness that the Americans were enjoying so much? As it happens, the rest of the world got something a little different while still essentially a Shield.

The Nvidia Shield isn't a single Android device these days; it's actually made up of two separate components. As with the Green Throttle we looked at earlier, it could be argued that this isn't a true under-the-TV Android device. However, it can be, and it's generally used as such in homes around the world.

The two components that make up this Nvidia Shield set are the Shield Tablet and the Shield Controller. Starting with the tablet side of things, we have an Nvidia Tegra K1, a 192-core Kepler GPU combined with a 2.2GHz quad-core Cortex A15 CPU. There's 2GB of memory, 16GB or 32GB of built-in flash storage depending on the model; an 8" full HD screen, wi-fi, Bluetooth and a micro-HDMI for connecting to a TV and using the tablet in Console Mode – which is why we have it in this group.

The tablet can be used on its own, even in console mode, and you're free to use whatever compatible Bluetooth controllers you have available. However, you won't get the full benefit of the package unless you opt for the Shield Controller as well.

The Shield Controller differs slightly in its design from the usual modern gaming controller. The D-Pad, for example, is positioned higher up on the left, where the analogue stick usually lives, and here both the sticks are positioned towards the centre and much closer together.

This makes the controller a little difficult to get used to, if we're being honest. It's solidly built, without question, but it makes for an uncomfortable position for any lengthy gaming sessions, and it feels quite heavy as well.

It does have some interesting features, though. You can use the built-in microphone for launching apps, and there's an integrated headset port on the front of the controller with a volume rocker-type button at the base. It's a capable controller, to some degree, but it's locked into the Shield tablet and has extremely limited functionality when attempting to pair with anything else.

The tablet is an open Android 4.4 (KitKat) base, with the Nvidia elements and apps already installed on the home screen. This makes it, like the M.O.J.O. a far more versatile device than the Ouya, for example, and as before there's plenty of scope for gaming and other media-related apps to be installed.

The hardware is impressive on paper, but we did find it to be slightly slower than the M.O.J.O., especially when we tried out a few of the games – *Dead Trigger 2*, for example. And it's horrendously expensive too.

The Shield tablet itself will set you back around £235, and it's around £50 for the controller. So for nearly twice the cost of the M.O.J.O. you're getting a setup that's probably about as capable as the Mad Catz entry, with a few extra bells and whistles added for good measure.

Although the Nvidia Shield set may appear to be the ultimate in Android micro-consoles and media devices, it's not as good as the M.O.J.O., although you can use it as a separate tablet.

PlayJam GameStick

DETAILS
- Price: £79.99
- Manufacturer: PlayJam
- Website: goo.gl/iiE0Hk
- What's needed: Android/Google account, GameStick account

A nice idea, but let down due to poor quality development, parts and designs

There's not much going on with the GameStick, so save your money

The PlayJam GameStick is a slight variation on what we've tested so far. As opposed to being a set-top box sort of device, the GameStick, as the name suggests, is simply a USB-sized stick that plugs directly into the HDMI port of your TV.

While this sounds a far better solution than the previously reviewed items, it does have a few drawbacks. For one, the HDMI port alone isn't enough to power the device, so you'll need a separate power adapter, using either the USB cable that comes with the package or the included power supply.

Another element to consider is the fact that this, in terms of what we now have available, is a drastically underpowered device. The Cortex A9 CPU and Mali 400 GPU aren't much better than what you'd find in a lower spec phone these days. It does have 8GB of built-in flash storage, even though there's only around two and half gigabytes available to store any apps and games on. However, there's a micro-SD card slot with support for up to 32GB cards, so you can at least expand somewhat if necessary.

The design of stick is quite novel. The actual stick is to be found inside the accompanying controller, so all you need to do is pull it out from its allotted slot on the top of the controller and plug it all in. The idea is to create a more portable gaming and media device, but once you factor in the power use, it begins to get a little messy behind the TV.

The controller is, quite frankly, awful. Its rectangular design doesn't fit well in the hand, and it feels decidedly cheap. The buttons, shoulder triggers, analogue sticks and D-Pad all feel very weak and poorly designed. Imagine an old NES and Sega Master System controller in a more modern, mass produced setting.

Setting up the device involves a lot more than the standard Android sign-in process. When it's finally powered up, which takes an exceedingly long time, you're given an activation code, which you'll then have to enter into the GameStick online site to create an account. The UI involved here is far from perfect or usable for that matter. It's slow to respond, you can't scroll down the menus, and the aspect ratio on the TV needs to be set then, for some odd reason, reset again.

Once in, you're presented with an interface displaying the latest games and media apps. The game section is rather small (about 40 titles in all), and the Media Apps option reveals a grand total of two apps available – GameStick Media Player and Tofu Media Centre – neither of which we could get to work.

In the end, although the PlayJam GameStick is a novel and interesting idea, it fails drastically when in use. And considering you'll be paying £79.99 for it, there are a lot of flaws to take into account here. You're best off leaving the GameStick alone, then.

MK802IIIS

DETAILS
- **Price: £44.99**
- **Manufacturer: Rikomagic**
- **Website: goo.gl/xCqTn5**
- **What's needed: Android/Google account, some device to control the desktop with**

The Rikomagic MK802IIIS is the third-generation device that bears the MK802 name. These are a brand of mini Android stick devices that, like the aforementioned GameStick, plug directly into the HDMI port and offer Android connectivity straight to the TV.

This particular model features a 1.6GHz Rockchip RK3066 ARM Cortex-A9 dual-core CPU, Mali 400 GPU and 1GB of main memory. There are two models available, one with 4GB of storage and the other with 8GB, plus there's an SD card slot with support for up to 32GB cards to expand into.

In addition to the SD card slot, you also get a full-sized USB port and a pair of micro-USB ports. There's 802.11 b/g/n wi-fi available, Bluetooth 4.0, and the OS is Android 4.1. As before, with the GameStick, you'll need to power it from one of the micro-USB ports; the cable is supplied in the box, which adds to the number of cables being dangled down with the device and hanging out of the back of your TV. Once plugged in, though, there's a handy HDMI extension cable included with the device, it's simply a matter of connecting a standard wireless mouse to one of the USB ports and navigating the Android desktop as you would normally.

Another Android stick to poke out the back of your TV

Once you include a mouse, USB storage and so on, things get a little crowded back there

> **"We did feel a uncomfortable with the amount of heat being generated"**

Other than the Play store and a few other Android apps, there's nothing too specific about the setup on the MK802IIIS. Once you have a wi-fi connection, all you need to do is locate the apps you want in the store and install them as you would normally.

The apps that we ran as part of the test responded as we would expect from a small, fairly low-powered device. The media app together with ES File Explorer worked well enough, allowing us to access the music and movies on our NAS. Games, on the other hand, didn't run all that well. The few more recent titles that we tested were jerky and nearly impossible to play. On the other hand, the older titles played without any fuss, and again there's plenty of scope for emulation of older consoles and computers.

One thing we did find a little worrying about the MK802IIIS was the temperature of the device after just 15 minutes of use. Although we don't know exactly how hot it actually got, we did feel a uncomfortable with the amount of heat being generated inside and transferred onto the outer casing.

Although the Android on a stick concept is generally good, we don't much like having all the extra cables, often at odd angles, protruding from the back of the device that's connected to our TV. Having a mini-console type of device as opposed to a stick is a far neater method of connection. And of course, there's the increased level of heat generated from such a tiny device that has a heck of a lot of work to do.

The Rikomagic MK802IIIS is priced at around £44, which isn't too bad. However, it's £44 that's better spent or going towards something like the Mad Catz M.O.J.O.

Mad Catz M.O.J.O.

Although the Nvidia Shield was, on paper, a more capable setup, the added expense didn't float our boat. The Mad Catz M.O.J.O., meanwhile, was an excellent performer and the more versatile of the two.

Nvidia Shield set

It goes without saying that the Nvidia Shield Tablet and Controller are exceptionally good. The price, though, is really too much for an Android mini-console. You could buy a PS3 and a number of games for the same price.

The tablet side is good, but without the controller it's not a complete package, which is why the M.O.J.O. beat it today.

How We Tested

Each console was connected to a Philips 288P6 4K monitor, via the HDMI port. The apps tested were ES File Explorer, to navigate to the device's folder structure and our NAS that contained both music and HD video.

The games on test were *Dead Trigger 2*, *Modern Combat 5*, *Tiny Thief*, *Sonic Dash*, *Raiden Legacy*, *Riptide GP* and the Mega Drive emulator MD.Emu.

	Ouya	Green Throttle	Mad Catz M.O.J.O.	Nvidia Shield Set	PlayJam GameStick	MK802IIIS
Price	£85	£17	£150	£235 Tablet, £50 controller	£79.99	£44.99
Android Version	Android 4.0	Needs 4.0.3	Android 4.2.2	Android 4.4	Android 4.2	Android 4.2
CPU	1.7GHz Tegra 3	A9+ needed	1.8GHz Tegra 4	2.2GHz Tegra K1	1.5GHz Cortex A9	1.6GHz RK3066
Memory	1GB RAM	1GB RAM+	2GB RAM	2GB RAM	1GB RAM	1GB RAM
Storage	8GB	8GB+	16GB	16GB/32GB versions	8GB	4GB/8GB versions
No Of USB Ports	2	0	2 (1 is USB 3.0)	1	1	2
Wi-fi	802.11 b/g/n	0	802.11 a/b/g/n	802.11 a/b/g/n	802.11 b/g/n	802.11 b/g/n
Bluetooth	4.0	4.0	4.0	4.0	4.0	4.0
Come With Controller?	Yes	Yes	Yes	No, separate purchase	Yes	No

Tech Origins
Virtual Machines

David Briddock reveals how a 50-year old idea drives today's cloud computing

Did you realise the original virtual machine (VM) pioneers were companies like General Electric, Bell Labs and IBM way back in the 1960s?

IBM

Early IBM mainframes were designed to run long, computational batch jobs and so only offered single user access. However, after losing out on contracts awarded to rival multi-user systems from GE and others, IBM decided to initiate its CP series programme.

The first commercial version, the CP-67, ran an operating system referred to as CP/CMS. CMS stood for Console Monitor System and was a small terminal-based single-user operating system. The CP component was the Control Program, which created virtual machines, each with its own instance of CMS.

At that time, a typical multi-user system shared out slices of single CPU processing time across all logged-in terminals (a classic example being MIT's MultiCS, which later evolved into UNIX), so giving every CP series user full operating system access was revolutionary.

Desktop

In 1987, Insignia Solutions applied the IBM CP concept to the desktop to create its SoftPC software emulator. SoftPC enabled UNIX workstations users to run DOS applications. At the time, a PC running MS-DOS cost around $1,500. However, the SoftPC application offered DOS compatibility for a only $500.

By 1989, Insignia Solutions had released a Mac version of SoftPC and soon after enhanced the product to support both MS-DOS and Microsoft Windows applications. An alternative version provided IBM's rival OS/2 compatibility.

Inspired by SoftPC's success in 1997, Apple created a product called Virtual PC, which was sold through a company called Connectix. As Virtual PC allowed users to run a full copy of Windows on the Mac, it was a popular product in the business community.

All this desktop VM activity prompted a newly formed company called VMWare to develop its first VM workstation product.

Enterprise

By 2001, VMWare had branched out into the enterprise market with ESX Server and GSX Server. Sales soared, and VMWare enjoyed exponential growth in the enterprise market, adding many complementary products.

ESX Server is known as a Type-1 Hypervisor, as the VMs don't require a host operating system. In contrast, a Type-2 Hypervisor (like GSX Server) runs its VMs on top of operating systems like Linux or Microsoft Windows. Consequently, a Type-1 Hypervisor requires far less system resources than a Type-2.

Meanwhile, Microsoft acquired Connectix in 2003 and released a revamped Virtual PC application as the Microsoft Virtual PC 2004.

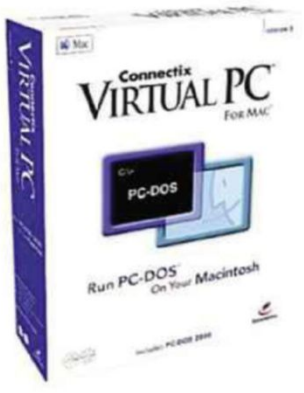
Despite holding a prominent position in the networking arena, Citrix didn't enter the virtualisation game until 2007. Rather than build something from scratch, Citrix acquired the open source Xensource platform and simply renamed it to Xenserver.

Cloud VMs

Today, virtualisation has moved to the cloud. Across the world, giant server centres run by Google, Apple, Microsoft, Oracle, Amazon, Facebook, Twitter, NASA and others are packed with tens of thousands of server racks, with each server running multiple VM instances.

These cloud-based VMs help provide search services, instant messaging, website hosting, data storage, e-commerce, online games, enterprise-level office suites, scientific research and much more. **mm**

IBM VM mainframe



Connectix Virtual PC

The Download Directory

James Hunt scours the internet for the best freeware, shareware and paid-for application releases

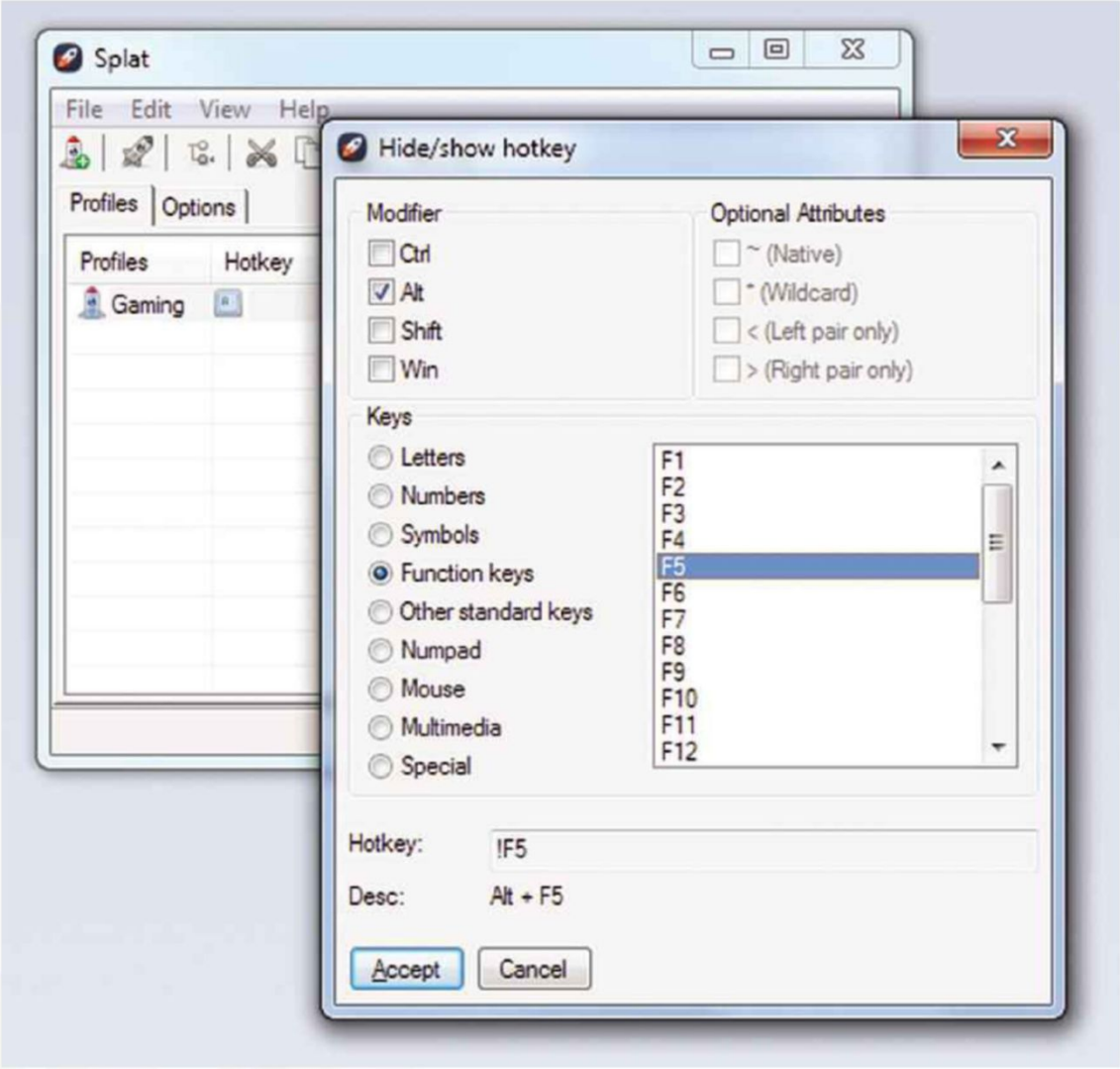
This month's applications include Splat, a program designed to help you launch batches of software; File Downloader, a utility that downloads individual files for you with a powerful command line component; AntiSnooper, a window-obfuscation application that prevents your screen from becoming the target of nosy people; and HDDB, an NTFS search tool that works much quicker than the Windows default one.

Splat 1.0.1

Release Type: Freeware
Official Site: skwire.dcmembers.com

If you find yourself wanting to launch multiple programs in one go (for example, a suite of development tools or the various applications you use during a web browsing session), then you probably haven't thought about whether the process could be automated. As it turns out, it can. You just have to use Splat to do it.

SPLAT (Simple Program Launching and Termination) allows you to launch multiple applications, background services, explorer folders and even web pages however you want. You can specify rules that figure out how and when to launch the programs or create hotkeys that do the job for you. A gaming profile, for instance, might close down your browser and any resource-hungry background services so you can game in relative peace. Or you could create a hotkey that opens your webmail, Facebook and Twitter pages at a single stroke. The possibilities are almost endless.



They're further enhanced by the software's generally expansive capabilities. The software allows you to create instructions that recognise how taxed your processor currently is and only launch applications when it drops below a certain level.

> **SPLAT (Simple Program Launching and Termination) allows you to launch multiple applications**

Or it can be told to wait a certain number of seconds before each launch, so you don't create a resource bottleneck that slows down all of the launches.

The program has been designed with its practicality in mind. Programs can be set to only launch if they're not running already (in case you don't want multiple instances), and the ability to set hotkeys is massive, allowing you a combination of any number of keys and even mouse inputs. Despite this complexity, the interface is relatively easy to understand, if not necessarily simple. It's a little rough around the edges, with labels occasionally obscured by the default sizing of columns and a starting size that's generally too cramped until you tweak it a little.

Still, that's mostly just aesthetics. The program itself works great, and while there are other programs that do similar jobs, there's nothing that does them quite as well as this. It's a niche product, for sure, but it fills that niche like a hand in a glove.

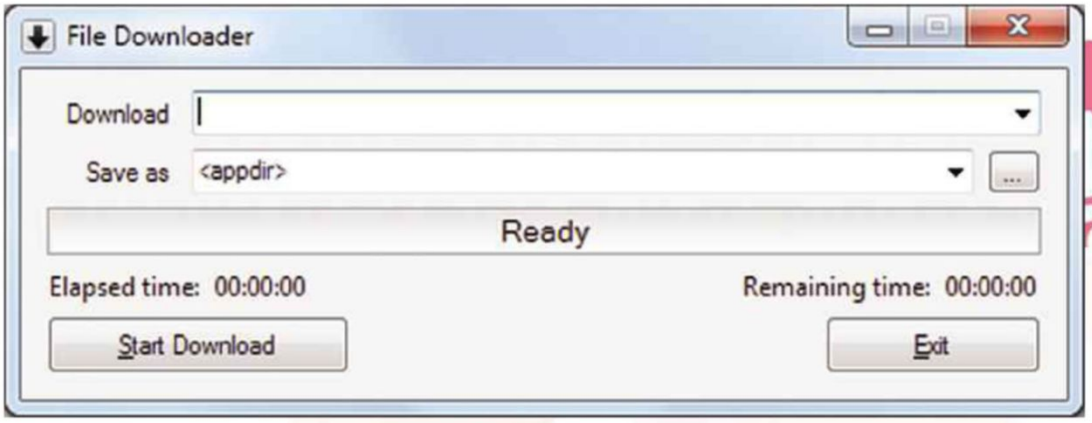
Pros: Extensive options, straightforward presentation
Cons: Slightly rough interface
Rating: 5/5

File Downloader 1.0.0

Release Type: Freeware
Official Site: www.donationcoder.com/forum/index.php?topic=39932.msg372542

Downloading files using Windows isn't always as easy as it looks. If all you have is a URL, you generally have to use your browser to get the file, and even then it's not guaranteed that it'll download it. Sometimes it just opens the file in a way that prevents you from saving it somewhere you want. And that's just for single URLs. If you have a batch of them, it can be a long and tedious process to download files to where you want them.

As its name suggests, File Downloader is the response to those woes. Much like the Linux/Unix downloading tool Wget, File Downloader will parse URLs and pull the contents off



the web, saving them to your hard drive rather than loading them in a browser. It couldn't be more simple to use: enter a URL, choose where you want the file saved and then hit 'Start Download'. The program makes the necessary requests, and you're soon on your way to saving the file.

Even that would be enough, but File Downloader includes a number of extra functions, such as a pause and resume button, and (somewhat less obviously) a 'progress bar builder', which allows you to customise your download's graphical representation in a number of ways, allowing you to select style, gradient, colour, transparency and more besides. An odd, if not entirely useless addition.

Although the GUI makes things simple enough, power users might want to use the command line functionality instead. It makes automation even simpler, allowing you to combine it with other software and tools to create some increasingly powerful outputs.

Although it's numbered version 1.0, some aspects of it do feel a little unfinished. It would be nice if the program could resume downloads across sessions, for example, and the lack of any resume function means it's not much use as a download manager if your connection is at all unreliable – and those are the connections that need download managers the most.

Although it's not the most powerful tool of its type, File Downloader does have the distinction of being one of the easiest to use, which is likely to please people who find the command line intimidating. That, if nothing else, makes a good case for its existence.

Pros: Simple, portable, some advanced features
Cons: No resume function!
Rating: 4/5

AntiSnooper 2.1

Release Type: Freeware
Official Site: www.bagrify.com

If you work in a communal environment, whether that's an office, school or home, there are times when you don't want people to see what's happening on your screen. Maybe you have sensitive information visible. Maybe you're mid-task and don't want anyone getting nosy about what's going on. Or maybe you're just procrastinating and would prefer it if your boss didn't see what you're really doing with your time if you leave your PC for a minute.

Whatever the reason, AntiSnooper is the program that'll help you avoid a worst-case scenario outcome. The program is designed to give you the ability to completely hide an individual window, obscuring its contents completely either instantly or after a specified period of inactivity.

Betawatch

To help you stay on the bleeding edge of software releases, Betawatch is a guide to the experimental and unfinished versions of some of the most popular applications around. Can't wait for new features? Now you don't have to!

Firefox 35.0 Beta

www.mozilla.org/en-US/firefox/channel/#beta

This latest Firefox Beta was released last month, just in time to miss the last instalment of Betawatch, but you know what they say: beta late than never. In any case, version 35.0 includes a number of enhancements worth mentioning, some on the desktop version, some on Android.

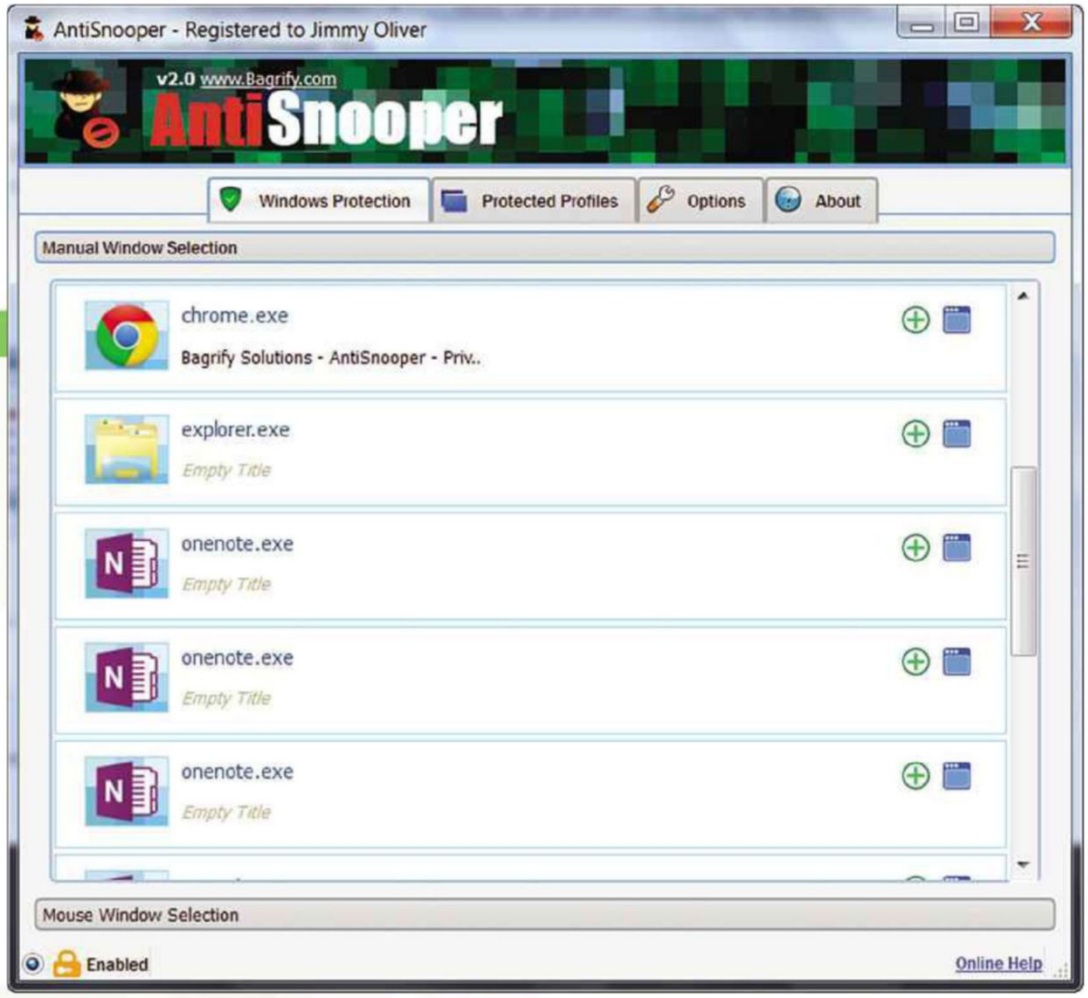
Desktop improvements include the creation of Firefox Hello, the new messaging platform that will appear in all future versions (unless it doesn't), built-in support for H.264 on Mac OS platforms and implementations of enhanced authentication for encrypted HTTP connections thanks to Public Key Pinning. Exciting stuff.

The Android version has a few more updates, the most prominent of which is that Firefox can now use your wi-fi and cellular data signals as a component in its geolocation service. This is an opt-in feature right now, so privacy adherents don't have to worry too much about what will happen to their potentially personal information. Other updates include HTTPS support on Bing by default, a search box added to network error pages and integration with the Android download manager.

Oh, and for the record, both versions of the software now include improved handling of dynamic style changes to keep pages responsive during rendering. Which, if you've ever struggled to follow a link while the page redraws around your mobile screen, represents a long overdue and very welcome addition to the software.

Bug fixes across both versions include JavaScript refinements, changes to CSS filter behaviour and support for new pseudo-elements in the developer mode, not to mention reduced resources for scaled images. On mobile, downloads made during private browsing sessions on Android will, in future, appear in the download manager.

As usual, you can download either Firefox beta at the above link, and there's little reason not to give them a whirl.



The workflow isn't particular intuitive, but it's not especially difficult: to hide a window, you find the program you wish to hide in the Window Protection tab of AntiSnooper's interface, perform a simple verification, and then create a profile with your preferred time-out value (if any) and the type of protection you want to enable. There are a variety of effects to select, all of which obscure the visuals in a different way, so you can select the one that makes sense to you. Once the profile is active, the window will be covered up after it's shuffled into the background for long enough, and the obstruction won't be removed until you manually release it.

> **"Searching for files in Windows can be a thankless, slow and ultimately frustrating task"**

Of course, you can temporarily suspend any protections if you want to use the software, and there are a number of auto-launch options as well, depending on how serious you want to get while using the software. In some ways, it's arguably a much more complicated alternative to simply closing the program before you leave your system, but if that's not possible this will essentially do the job for you.

Given its stated function, it would be nice if AntiSnooper could go a few steps further and completely hide programs – including itself – using a hotkey like other similar tools do, but the functionality that is in here works well enough. Unfortunately, it's just not powerful enough to be a one-stop privacy solution, so in that sense it falls down, but if you like what it does, there are no real problems with that.

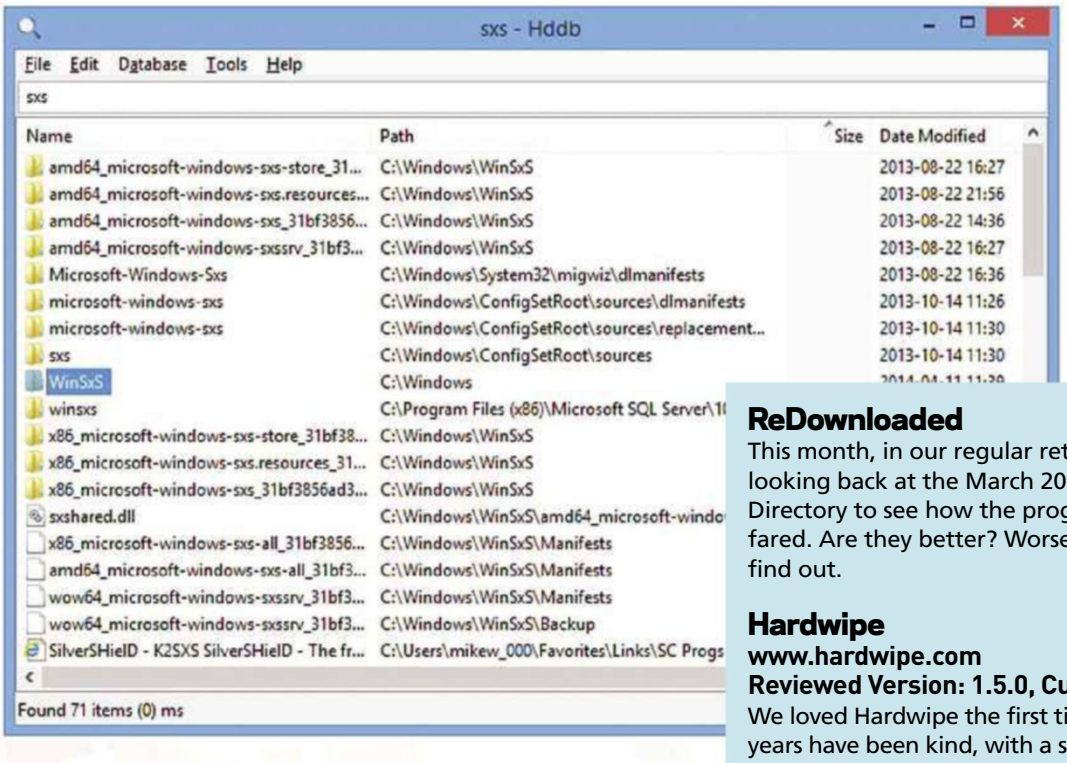
Pros: Interesting and useful idea
Cons: Not the most straightforward process
Rating: 3/5

Hddb Portable 4.1.0

Release Type: Freeware
Official Site: hddb.xp-zed.com/index.html

Searching for files in Windows can be a thankless, slow and ultimately frustrating task, partly because of how Windows' indexing works, but mainly because the search interface seems to revel in being as obfuscated and unusable as possible. For those times when you want to search for a file and have a significant amount of control over the results, you might want to download HDDB and give that a try.

Available in a portable version (which, for us, is always preferable to an installation) HDDB is a search tool for any NTFS drive. It only searches filenames and pathnames, rather than a file's contents, but in most cases that's what you're looking for anyway. All you have to do is start typing, and the results



will arrive nearly instantly. No churning of drives or waiting for progress bars to creep across the screen.

Once you've found a result, it's as simple as you could ask to then launch the file, open it and see its contents or skip to the directory in which it's being kept. You can also export the file list

> **"There are times when you don't want people to see what's happening on your screen"**

to a plain text report in case you want a record of the files to refer to later or otherwise manipulate.

The basic intention was for the application to be a clone of the similar, more popular search tool Everything, but as the program has developed it's found its own niche. Indeed, some of its features are a definitely an improvement over Everything, not least the fact that it'll perform searches without Administrator privileges, so the flurry of User Access Control prompts you might otherwise be faced with are mercifully absent. It also manages its database a bit more loosely, so you don't have to wait for a refresh every time it launches.

Other features include the ability to create common search filters, a query composer to help you manage more targeted searches based on various file attributes and, somewhat oddly, a built-in web server so you can check your file indexes remotely. Well, it's probably useful to someone.

Pros: Fast and powerful
Cons: No 'search inside files' option.
Rating: 4/5

ReDownloaded

This month, in our regular retrospective section, we're looking back at the March 2013 instalment of Download Directory to see how the programs we reviewed have fared. Are they better? Worse? Gone completely? Here, we find out.

Hardwipe

www.hardwipe.com
Reviewed Version: 1.5.0, Current Version: 4.1.2

We loved Hardwipe the first time we looked at it, and the years have been kind, with a succession of releases that have only improved the software. If you're looking to clear a hard drive in preparation for reuse, resale or disposal, Hardwipe is easily the definitive piece of freeware for doing the job. It even guarantees 'no crapware', so you can download and install it without fear that it will try to install an ad bar.

VueScan

www.hamrick.com
Reviewed Version: 9.2.4, Current Version: 9.4

A piece of paid software designed to add backwards compatibility to older scanners that are no longer adequately supported by Windows, VueScan was good at its job but ridiculously expensive at $40. Well, it's now $10 cheaper, but it's also two years older without much of an update, so make of that what you will. Still your only real choice for getting old scanners working either way.

SnapCrab

www.fenrir-inc.com/us/snapcrab
Reviewed Version: 1.1.1, Current Version: 1.1.2

A program for taking screen captures with some unique features, like Twitter and Flickr integration, self-timers and transparency capture, SnapCrab impressed us at the time, so it's a little disappointing to see that it's received so little attention in the intervening period. It's still good, no doubt, but perhaps it just never got the traction it needed to be worth spending time on.

ImDisk

www.ltr-data.se/opencode.html/#ImDisk
Reviewed Version: 1.5.7, Current Version: 1.9.4

Another strong showing (clearly, March 2013 was a good month), ImDisk is a virtual disk driver that allowed you to create all manner of virtual drives in Windows and other operating systems. It has since expanded its support to include Windows 8 and received frequent updates and improvements. And it's not like anything better has come along in the meantime.

Remembering... the Playstation

David Hayward recalls the one console that went on to rule them all

At a time, roughly the early 90s, when we were beginning to grow out of our 16-bit computers and starting to collectively join the world of the PC, the console market had some pretty interesting alternatives. The Neo-Geo, SNES and Sega Megadrive were well established by the mid-nineties, but it was the death of the cartridge and the adoption of optical media allowed the developers to begin to explore more elaborate gaming methods through the extra memory now available.

This move also lead to cheaper game production costs, and that suppliers could now issue a request for a million more copies of a game – should they need it – and have it fulfilled in a matter of weeks on CD, as opposed to the lengthy waiting time for a cartridge to be built.

Rumours soon began to circulate of a vastly improved console that would be coming from the direction of the newly formed Sony Computer Entertainment Inc. A console that would be capable of the latest 3D gaming technology, which used CDs as the medium of game delivery, and that would be a lot cheaper than the current rival consoles. On December 3rd 1994, these rumours were realised, and the Sony Plasystation was launched to an eager audience.

Its History

If internet history is to be believed, the Playstation concept was the result of a collapsed deal between Sony and Nintendo. Thoroughly cheesed off, the former conducted a meeting to discuss the company's response, a meeting where hardware engineer Ken Kutaragi showcased his idea for a CD-based gaming system.

Not everyone in the meeting was taken with his vision, though, and opposition to his idea lead to Ken and his team working out of Sony's Music headquarters instead of the gaming division. This unusual alliance became the nascent Sony Computer Entertainment arm of the larger technology empire, and the eventially the arm responsible for the development and release of the Playstation.

Needless to say, the Playstation was a huge hit – a pivotal moment in modern gaming history, some will tell you. This excellently produced system, with its advanced 32-bit RISC, 33.7MHz processor and dedicated GPU, along with optical disc loading and portable memory cards, fast became the most popular console ever produced. For a while, it would seem like everyone had one.

Within its first year, the Playstation had sold a whopping one million units in Japan, with 350,000 units on release throughout Europe. By 1998 the amount of units sold had hit a staggering 50,000,000. And by the turn of the millennium, the Playstation became the first console in history to sell one hundred million units.

The Good

The original controller was one of the most well-loved game controllers ever; a basic design that is still followed today. Also it was a remarkably stable machine, compared to a modern console at least, and it was relatively easy to modify and use homebrew titles with.

The Bad

Unless you wanna talk about sore thumbs, *Wip3out 2097* addiction and its accompanying thousand yard stare, getting beaten by you girlfriend at button-mashing classic *Tekken II*, or how criminally underrated *Kula World* was as a puzzle game; nothing, basically. We pretty much loved it all.

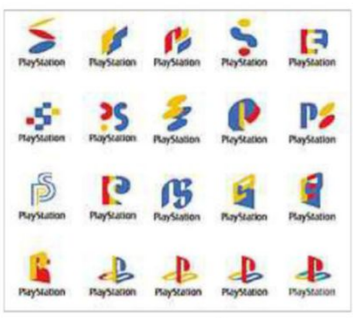
Conclusion

The Sony Playstation was nothing short of a triumph in console engineering. The likes of *Gran Turismo*, *Final Fantasy VII* and *Tomb Raider* offered we early gamers a taste of what eventually would come along in the next twenty years.

Did You Know?

- The screen resolution was limited to 640 x 480
- It only had 2MB of main system memory, 1MB of video memory, 512KB of sound memory and 512KB dedicated to the operating system
- Ken Kutaragi developed the SPC700 sound processor for the SNES
- While the original *Ridge Racer* was loading on the Playstation, players could try out a version of *Galaxian*. If they shot all the invaders, they could race bonus cars
- The creator of *Minecraft* received a gold PS One from Sony

It was a fine looking machine, the original Playstation



There were, apparently, the designs submitted for the PS logo

According to internet rumour, this was the first Playstation concept design

So You Want A Real Media Centre? The Windows Build

In the third part of this series, Leo Maxwell looks at a Windows-based media centre solution

Last week, we looked at assembling the hardware for a home theatre PC (HTPC), and this week we are going to look at the software. As most of you out there are probably Windows users, we will be starting with a Windows version, but many of the features are shared by the Linux equivalent. While both of the projects in the next two weeks are capable of being used as a desktop PC as well as a media server, this sort of setup is not for those who just want to watch a bit of telly on their PC.

Once you start to use it as a family media centre, it becomes difficult to use it for anything else, and using it for processor intensive tasks while the main back-end program is running may interfere with TV recordings.

Hardware

I installed this on the PC featured in last week's article: an Asus AM1-A motherboard with a quad-core 2.06GHz AMD Kabini processor, 4GB of RAM, a 1TB hard disk and a TBS 6281 dual tuner PCI-E HDTV card.

For this project, I will be using Windows 8.1, to be up to the minute, but I have tested the HDTV card that I have chosen and it works well with both Windows Media Center and Mediaportal on Windows 7.

Preparation

If you are lucky enough to have nice new hardware that came with Windows 8.1 installed, you will have saved yourself half a day or more of installing and updating. Lucky you.

I, however, started off with a clean, bare PC, so had to install Windows 8.1, drivers, updates, anti-virus, and anti-spyware. Like a great many people, I am not a fan of the Windows 8 tiled interface, so I also added Classic Shell from **www.classicshell.net**, and a few extras such as Adobe reader etc. Once I reached the position of a fully installed, patched and configured OS, I was ready to look at setting up my TV card and software – in the past, this might have involved Windows Media Center, but with Windows 8, Microsoft decided to make that a paid for add-on.

Fortunately, as with most TV cards, the TBS HDTV card comes bundled with a few pieces of software: TBSVHID (a tool for customising the remote control settings), and OEM versions of two commercial TV and media managers (DVBViewer and DVBDream). These last two, while perfectly adequate, are not exactly pretty or feature-rich, so I decided to install MediaPortal, a free open-source package that can be for downloaded by visiting **www.teammediaportal.com**.

Installing The Application

Once your OS of choice is installed there are still a few additional requirements before you can install MediaPortal. It specifically requires .NET3.5 so, even though Windows 8.1 has .NET4 is already installed, you will need to go into the Control Panel > Programs > 'Turn Windows features on and off' amd tick '.NET framework 3.5', then click OK. Windows should then download and install the earlier version of .NET, which can quite happily co-exist with version 4. Windows 7 users, can fnd .NET 3.5 as a free download from the Microsoft site at **tinyurl.com/c6zpqp7**.

You then have a choice of which database to use. The default is MySQL5.6 (a well respected open-source database product) or

Microsoft SQL2008 Express. Both are free, but MySQL is installed automatically by the MP installer, so that will save you at least half an hour. If you wish to use the Microsoft product, you will have to download and install it yourself before you get around to installing MediaPortal.

If you are running any sort of Firewall, you will also need to unblock the Mediaportal application.

Installation

Once you have the foundations in place, the first stage of the MediaPortal installation involves answering a few questions. If you choose the custom install, you can install the client and server applications separately, so that multiple clients can access the server across the network. After that, if you select the one click install, the installer downloads, extracts and configures all of the necessary components.

While installing MediaPortal is fairly straightforward, there are two options to consider and the choice that you make depends on how you want to use the PC. If it will only ever be used as a standalone, then you can install the combined version of MediaPortal. This is the simpler solution, but you will need a separate tuner for each TV channel that you want to record. If you want to stream across the network or record multiple channels

> **“This sort of setup is not for those who just want to watch a bit of telly on their PC”**

from each tuner, you will have to install MediaPortal with TV-server, which is a separate back-end database.

Having a separate back-end enables you to record more than one channel from each digital tuner, (as long as they are on the same multiplex), and to run more than one front-end, so that you can watch Live TV or play media on other devices on the same network without a TV card.

MediaPortal itself can function as a front-end on another Windows PC, but various front-end clients exist on other devices and platforms. Kodi (formerly, and probably better, known as XMBC) is an excellent tool for this purpose. It has several connectors for other back-ends as well as MediaPortal, and it runs on Windows, Linux, and OSX. It even has an Android version, which means that you can use it to watch live TV on a phone or tablet.

The first screen of the installation

Server Setup

After installation, you need to run the TV Server set-up by double-clicking the icon on the desktop.

In the first screen you are asked what database you wish to use (I chose MySQL). The default password for MySQL is ‘MediaPortal’ (note: the password is case sensitive, ‘mediaportal’ will not work), though you can change this, but if you do, make sure you do not forget the new one! Once the database is installed, click the ‘test’ button and, after a successful test, click ‘save’ and the TV Server configuration utility pops up.

Here, if your card is recognised, you can scan for channels and set various options, including selecting the channels that will be visible in your program guide. Once all this is completed, click OK.

Front-end Setup

Next you need to run the Media Portal front-end configuration utility, by clicking the correct icon on the desktop. This allows you to select skins (there are quite few), set up various options for the front-end, such as where music and images are stored, your location for weather forecasts, etc. and alter the look and feel of the whole application.

And Finally...

Once you have finished configuring things to your taste, and have saved these settings, you can finally double click the MediaPortal icon, upon which the front-end is launched. One drawback of this package is that for many settings, to make changes you have to close it and run one or other of the configuration utilities again. If you are like me, you will have to do this several times before you are satisfied with the results.

The MediaPortal front-end is fairly easy to use, though, with a polished, responsive interface. The default skin may not be to your

Database? What for?

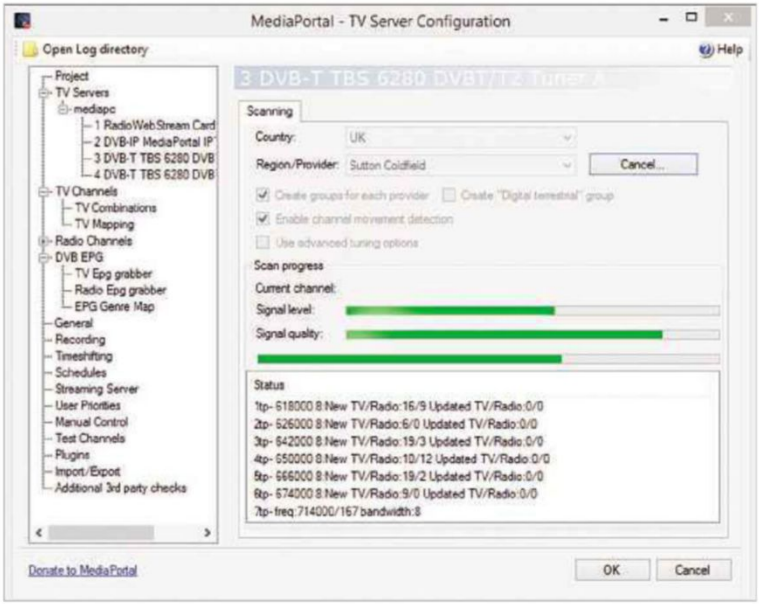
All PVRs require a database to store settings, program listings, recording information, etc. This database of information is also used to schedule recordings, as well as making them easily available for playing, the GUI allows you to view and sort or search lists derived from what the database holds.

MediaPortal and other media centre packages also store information about Music, Pictures, etc., such as the location of the file, the size, when it was last accessed, the artist, cover art and the like.

When you select a video recording, for example, on the front-end, MediaPortal uses the information in the database to select the correct media file, and notes where you are if you pause it for any reason.

Information stored in the database is used to auto-expire and delete recordings based on age, priorities, whether they have been watched or not, or rules set up by the user. MediaPortal standalone uses SQLlite, whereas MediaPortal TV server uses MySQL or Microsoft SQL Express. The level of configuration available is due to the total integration of the Database ‘back-end’.

In addition (if you opt for the separate back-end at installation), as long as the TV server back-end is running, scheduled recordings will take place even if the front-end is not running, and you can, for example, watch a DVD or play music while TV is being recorded in the background



➤ *Scanning for Channels on the TV card*

➤ *The MediaPortal frontend configuration tool. There is a lot of customisation available*

➤ *MediaPortal back -end configuration*

MediaPortal Features:

This is the feature list 'Out of the box'; additional functionality can be added by plug-ins and extensions that can be found from the MediaPortal site.

- Extremely configurable 'Ten foot interface'.
- Powerful and flexible PVR, support for multiple Tuners, multiple channels from a single multiplex.
- Configurable Electronic Program Guide
- Flexible recording – selection from program guide, conflict resolution, series record, commercial skip.
- Timeshifting – pause Live TV
- Support for multiple front-ends and back-ends.
- RSS News feeds, web browsing, audio and video streaming from the internet
- Audio replay CD, most audio filetypes, CDDB access, various shuffle modes, playlist support, etc.
- Video replay of most video filetypes, DVD, VCD, etc.
- DVD and CD burning
- Can function as a media server on a home network
- Picture gallery, slide show display
- Themeable
- A wide range of plug-ins and extensions

liking, but there are many available to suit a range of tastes – ranging from shiny to bizarre (and including an LCARS skin for the Trekkies among us). There are also a wide range of extensions and plug-ins to give you even more functionality, should you require it. Note, though, that not all of them are simple to install and configure.

Using a remote control to traverse the menus soon becomes second nature, and this is how the software is largely designed to be used. You can stick with a wireless mouse combined keyboard and trackpad unit should you wish.

Recordings can be organised in various ways, and can be set to 'auto-expire' the oldest and watched first if disk space becomes low. Pictures can be shown in a slide-show while music plays, and playlists are supported.

HDTV: Drivers And Codecs

As we covered last week, a TV card's hardware simply receives the requested multiplexed data stream and downloads it to a disk. The donkey work of decoding, decompressing and playing the stream is carried out by the CPU and GPU – that's why older generations of CPU struggled with HD video, compared to more recent models, that can offload much of the burden to the GPU. This means that current low-power units can still play full HD 1080p video smoothly; a process that controlled to a large extent by the video card drivers and codecs.

Codec is a combined word formed from 'enCOder-CECoder', and means a device or program used for encoding and decoding data streams. In Windows, the supplied Microsoft codecs are pretty poor, but MediaPortal can install the open-source LAV filters, which are a collection of audio-visual codecs. They make a huge difference to the quality of the output and the range of supported media files.

Digital Multiplexes

Last we we also established that digital TV and radio channels are transmitted in multiplexes. To re-cap: the seven UK multiplexes carry between eight and twenty-five channels each at the moment, with HD variants of some channels split across two of them. A digital

Plugins

MediaPortal adopts a modular approach, with features being separately developed as plugins that can enable various features.

There is a huge range of these, some of which are installed and enabled by default, whereas some need to be downloaded and installed, and others are still in development. Some of the more notable ones include:

Commskip Launcher: a process to skip commercial breaks
Power scheduler: allows the PC to go into sleep mode until it is woken (to record a programme, for example)
Conflict resolution: avoids clashes in recording times
RSS News: aggregates RSS news feeds
MAME - Retro Gaming Emulator
Sodoku - If you must (sigh)
IR-blaster support: allows you to control an external device, such as a Satellite decoder, or a Blu-ray player.
Webmediaportal: a web interface for Media portal

Although the default GUI is quite impressive, there is also a wide range of skins and extensions, notably the Enterprise-styled LCARS for the trekkies among you, and the Mustayaluca, my personal favourite among the many, many good options.

“All PVRs require a database to store settings, program listings, recording information, etc”

tuner will download all channels on a multiplex simultaneously, so it is possible for the software to separate them and save shows from more that one channel simultaneously, provided they are part of the same duplex. For example, recording BBC1, BBC2, BBC3 and BBC4 programs simultaneously requires only one tuner as this is how they are arranged.

While this is convenient, as TV schedules wander – and missing the end of a program because another recording is being started on another duplex is a pain – at least two tuners is recommended Two tuners can record several channels from each of two different multiplexes. In theory, seven tuners would be able to record or stream the entire terrestrial TV output!

DVD And Blu-ray:

If you want to play DVD or Blu-ray disks, in addition to a suitable optical drive, you will need a TV or Monitor with a HDMI, DVI, or DisplayPort connector, plus a Display card that outputs a HDCP compliant signal through one of these ports, and that is capable of driving a HD resolution screen. Blu-ray playback may also require quite a powerful processor, and proprietary codecs.

These are usually obtainable by purchasing and installing a proprietary Blu-ray player program on your system. Many PCs and standalone Blu-ray players come with bundled software that includes these. VLC and the LAV codecs may allow some DVD and BD content to run also. The copy protection on some DVDs and Blu-ray discs can cause playback problems, though, and it can seem a bit of a chore. However, while you may conclude disk-based media formats are gradually being replaced by digital delivery systems, 4K content may perhaps lead to a temporary revival of optical media so it's worth exploring the options.

Web Access

You can set MediaPortal up with its own web page, but it requires manual configuration. For this, you will first need to manually install and configure Microsoft Internet Information Server (IIS) .NET4 and ASP. There are detailed instructions in the Mediaportal Wiki (**tinyurl.com/ln2tjpf**).

Conclusions

Media Portal has grown from humble beginnings as a fork of XBMC to a polished, well-supported application. Those who have worked on it deserve applause for their effort and care. No other media package on the Windows Platform is as comprehensive or as flexible – and it is free!

Media Portal is open-source and free to redistribute under the GNU Public Licence, however, it relies on several closed-source Microsoft packages, notably C#, VB, .NET 3.5 and MSSQL, but this is only to be expected in the Windows world after all.

There is a diverse and enthusiastic community of developers and users at **www.team-mediaportal.com**, where you will find information on suitable TV cards, 'How-tos' on setting up various features, along with downloadable plugins, skins, documentation, and a lively discussion forum.

There is no doubt that MediaPortal is an excellent solution, but running on Windows means that in addition to the extra cost and resource demands, there is an overhead in terms of regular housekeeping. Disk defragmenting (especially important with a media PC, which constantly records TV), maintaining up-to-date anti-virus and anti-Spyware, applying updates, etc. is all essential. There is also the problem of configuring Windows and other applications to work with it (or, rather, not to interfere); you don't want an update window popping up in the middle of a tense moment in *Broadchurch*, do you?

It is possible to strip down Windows, disabling many services, and even removing the desktop, but it is not easy or risk free – and if you want to run multiple Windows clients it means a Windows license for each one, which can rapidly get expensive. There are, however, MediaPortal client plugins for Kodi, which will run on Linux, Mac, IOS and Android.

Disregarding the unpopular, tiled GUI, Windows 8.1 seems to perform well in this role, but as someone who uses both Windows and Linux regularly, I was quite surprised at the amount of time and effort involved in getting a Windows media server up and running. The need for multiple reboots after driver installs and Windows updates was an additional annoyance.

Next week, I will be looking at MythTV, a completely free Linux based solution on the same hardware. **mm**

RETRO ROUND-UP

Dave Edwards introduces a new monthly column

Welcome to the first installment of a new monthly retro round-up, for all of you who, like me, found your Christmas stocking stuffed with items like a handheld Mega Drive, an Atari Flashback and a PlayStation 1 Grand Theft Auto and memory card. This month we'll be taking a look at some of the new professional games for some of the classic British microcomputers – the Spectrum and Commodore 64 – and, directing you to those websites that sell them on the original media. In case you don't know, gone are the days when such media invariably found its way to the local charity shop after a few years. These cassettes and discs now offer savvy retro collectors something of an investment opportunity. Publishers generally only sell a very small number of them (most buyers opt to buy an emulator image for their PC for a fraction of the cost), and those people who, later in time, want to collect up such items, have been known to dig deep into their wallets to do so.

Heavy On The Spectrum

The Spectrum, being the most popular 8-bit UK home computer, remains the best supported retro machine. Cronosoft (**cronosoft.orgfree.com/shop.html**) offers around 30 new games for it, and its latest release is *Shape Shifter*, an overhead puzzle game to tax the old grey matter. All you have to do is to drag and drop the shapes you're given (which look remarkably similar to *Tetris*-pieces) into a square-shaped grid in the centre of the screen. The trick is that all the shapes need to fit into that grid, and to obtain any points, you have to complete the task before the bonus runs out. You cannot rotate the shapes either, and even by the third level the shapes you're given seem to be impossible to fit!

Also from Cronosoft comes *Splattr*, an arcade blast-'em-up from the angle of a person peering down into an overhead maze. From a screenshot, this game looks like a rather bad, blocky, basic game, but get hold of it and you'll find it's a frighteningly fast arcade machine code number for the 128K Spectrum only. It has big sprites and pulsating sounds to rock out to as you play, and you can see it in action with commentary here: **youtu.be/2rExuetoNVI**.

Egghead is able to run, jump and climb the ladders of his yacht in this superb platformer

You'd also be hard pushed to find a better platform game than the fifth *Egghead* in Jonathan Cauldwell's series, another 128K Spectrum-only game named *Egghead: Round The Med*. You're placed in Egghead's yacht and tasked with collecting up the aspirins (a la *Jet Set Willy*) from each room. However, find the navigation chamber and you will be able to steer the yacht to many different continents, each almost an additional full platform game in its own right. (**youtu.be/ZNNTTEbzq1w**).

All of these excellent games are all still available from Cronosoft for just £3.99 each. Quite apart from the fact that they will keep you entertained for a good few winter nights, collectors of early, now unavailable Cronosoft titles are regularly paying over the £20 mark for them on eBay, giving you even more reason to snap them up.

Monumental Spectrum

Monument Microgames, a relative newcomer to the Spectrum, has also churned out a number of new Spectrum games too. The most recent of these is the grid-based puzzle title *Game About Squares*, written by Andrey Shevchuk,.

You don't need any instructions for this game other than the game controls, and all these do is move one of the four coloured

Well, that's not going very well. And I'm only on level three of Shape Shifter!

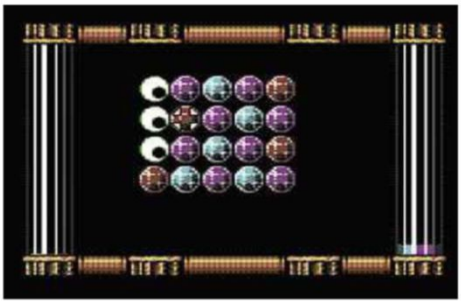
Paused screenshots of Splattr look like an art package, but that circle is in fact a crosshair and firing is going to make your Spectrum explode

In Game About Squares, the squares push each other along, so you need to move the red one in front of the blue one first. Get it? Good.

24 screens of positioning fun in Forest Raider Cherry, although the cherries are incidental; it's the diamonds you actually need

Genesis is an atmospheric shoot-'em-up with five themed levels and testament to what the 128K Spectrum is capable of

The jungle in Darkness is a fearsome place – spiders have grown to the size of humans!



Phase Out is the same idea as Bejewelled but with more brainwork involved

squares in the direction of an arrow in the centre of it. Squares push each other along, and the objective is to get each square to its 'home' position, represented by a dot of the same colour. It has a very gentle learning curve, and the 128K Spectrum version features a bouncy theme tune that plays throughout – and will need to be turned off when you need to concentrate. Again you can see a little of the fun that awaits you on YouTube at **youtu.be/kt2dBcE8BV0**.

Next up is *Forest Raider Cherry*. This game isn't quite as new as it appears, having done the rounds as a public domain release in 2010. It's a forest-based overhead maze game, in which you're tasked with finding 24 diamonds in each of the 24 'rooms' of the forest. Instead of a lives system, a simple timer counts down from 100. The diamonds don't appear until you have cleared each screen of cherries, so the race is on to collect them all, collect the diamond you need and then progress to the next screen and repeat. Bats and bugs have made the forest their home too, though, so you'll need to tread carefully. Colliding with any of them will see that timer countdown speed up. See **youtu.be/TyfHmV9nK8c** for more.

Finally, check out *Genesis: Dawn Of A New Day*, originally available from Retroworks (**www.retroworks.es/index_en.php**) until a few years ago. *Genesis* is a superb monochrome shoot-'em-up where you have to defend your planet against the threat from the 'Dork Menace' (really?). Like many more recent homebrew games, *Genesis* results from a collaboration between developers, and the game has already achieved cult status. You have to shoot/avoid the aliens, then defeat the level-concluding big bosses. There are many options to play about with, including toggling inertia on and off; turning it on makes the game twice as hard. See **youtu.be/COusxZBh5-k**.

As with Cronosoft, what's fascinating about Monument is the sheer quality of the finished product. *Game About Squares*, *Forest Raider Cherry* and *Genesis* all come in professional cardboard boxes, with stickers, CD, cassette and instruction leaflet as standard, for just £7.00. Again, despite virtually no marketing, Monument's earlier games have already sold out.

Commodore Supreme

Both Cronosoft and Monument Microgames are a little behind the homebrew market god Psytronik Software (**psytronik.net**), which has been supplying tapes, discs and CDs for the Amstrad, Vic 20 and Commodore 64 for the last 20 years. Its most recent releases are for the Commodore 64.

Darkness, written by Trevor Storey and Achim Volkers, is available in six different versions, including an Ultimate Edition, of which only ten units now remain. In this overhead maze game in the flick-screen *Sabre Wulf* style, you're tasked with finding eight mask pieces scattered around a jungle environment. Putting together the mask will allow you entrance to a sanctum where your girlfriend is being held.

As you move from room to room, you need to shoot at all the animals that threaten to touch you, and I found holding down the fire key throughout was preferable to pressing it over and over.

All the versions of *Darkness* come in professionally designed boxes, with prices ranging from £7 for the standard cassette version to £24.95 for the Ultimate Edition, which includes a keyring, sticker and a poster. It's up to you to decide if these extras ultimately justify the increased cost, but to assist you, why not watch an unboxing (see **www.youtube.com/watch?v=AQC2TcFQgLk**)?

Late 2014 also gave us *Phase Out*, a ball-based puzzle game in which clusters of different coloured balls must be flipped Bejewelled-style to erase them from the playing area. As with *Game About Squares*, *Phase Out* dispenses with instructions in favour of starting you out on a level you cannot lose. In completing the level, you're forced to understand how the game actually works, and from that moment on, the game has hooked you into completing screens of further and further devilish complexity. For more, visit **youtu.be/xFBjsZfpq0I**.

Conclusion

While having to lay out more money for a retro title than a second-hand PC game won't be to everyone's taste, I hope this article has piqued at least a bit of additional interest in this scene. The games mentioned here are not necessarily the cream of the retro crop for 2014 by any means, and you'll find many other games for sale for you to either play or display on your shelf as a great talking point. If any of you go on to order any of them, make sure you tell the websites why – and that we sent you.

See you again in issue 1350! **mm**

Cronosoft (cronosoft.orgfree.com/shop.html)		
Egghead Round The Med	Spectrum 128K	£3.99
Shape Shifter	Spectrum 48K	£3.99
Splattr	Spectrum 128K	£3.99
Monument Microgames (www.monumentmicrogames.com)		
Forest Raider Cherry	Spectrum 48K	£7.00
Game About Squares	Spectrum 128K	£7.00
Genesis: Dawn Of A New Day	Spectrum 128K	£3.99
Psytronik (psytronik.net)		
Darkness	Commodore 64	£7.00-£24.95
Phase Out	Commodore 64	£7.00

Secure Vault Apps For iOS

Keep your data and files private with Keir Thomas's look at six of the best encrypted data stash apps

If you set a passcode on your device – and iOS pretty much forces us to nowadays – then your iPhone or iPad's data will be encrypted so that even the US National Security Agency can't decrypt it (allegedly). But that's not the end of the story. You may still want to protect individual snippets of data or files and pictures, from those to whom you loan your phone or iPad, such as when your kids play Peppa Pig.

The solution is provided by secure vault apps. Put simply, these lock away data via encryption, using their own passcode and security protocols. That's only the start of the feature set, however, and app developers have innovated in interesting ways, as you'll discover below.

As usual, all the apps were reviewed using an iPhone 5 and Retina iPad and are free in the App Store. Note that we don't cover dedicated password manager apps in this week's group test, such as LastPass or 1Pasword. Although these often have secure vault features, we'll be covering them in a separate group test in future. However, some of the apps below do have the ability to store usernames and passwords in addition to other snippets of data.

Apps described as iPhone-only will work on the iPad in magnified mode but obviously won't provide a first-class experience.

Secret Photo & Video Calculator

You might be wondering what a calculator app is doing in our group test. Aha! That's what you're supposed to think! This is actually a secure vault hiding behind a fully functional calculator app, albeit one that's sadly iPhone-only. It's identified in the app store by the name above, but on the home screen is labelled as Calculator+. We guess this makes sense bearing in mind the goal of obfuscation.

On using the app for the first time you'll be prompted to create a PIN. To unlock the vault subsequently you'll need to type this number and then tap the percentage symbol on the calculator keypad.

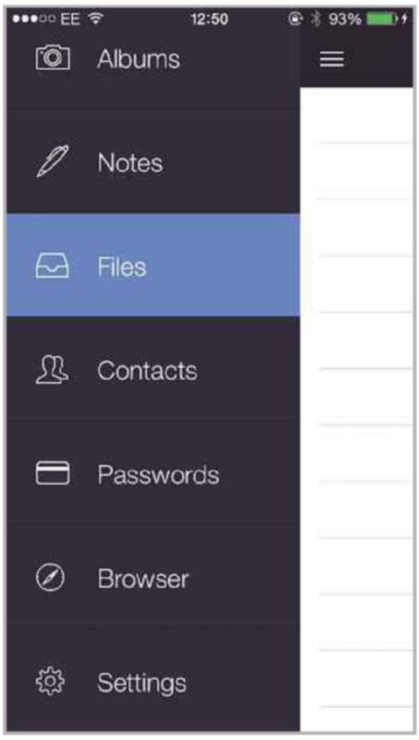
Out of the box you get to create private photo albums, notes and add passwords to the vault. What you sadly don't get, but which are entries within the app's menu, is the ability to stash files in your vault (a 79p in-app purchase) or the ability to use a private web browser (another 79p). You're also limited to adding a single password entry to your vault, making that aspect of the app essentially useless.

You're also limited to a single photo album (£2.29 unlocks that particular block), but there didn't appear to be any limit in the number of photos you can add. Adding photos is done by tapping the plus button at the top right and either choosing them from your existing libraries or Photo Streams or by snapping a photo there and then. Rather annoyingly, adding an existing photo to the vault doesn't automatically delete it from its existing location, so you'll need to remember to do that manually (and don't forget that in iOS8 actually eradicating photos entirely from your device can be difficult). Even more annoyingly, getting a photo out of your vault and into a different app is again blocked unless you stump up for that £2.29 upgrade.

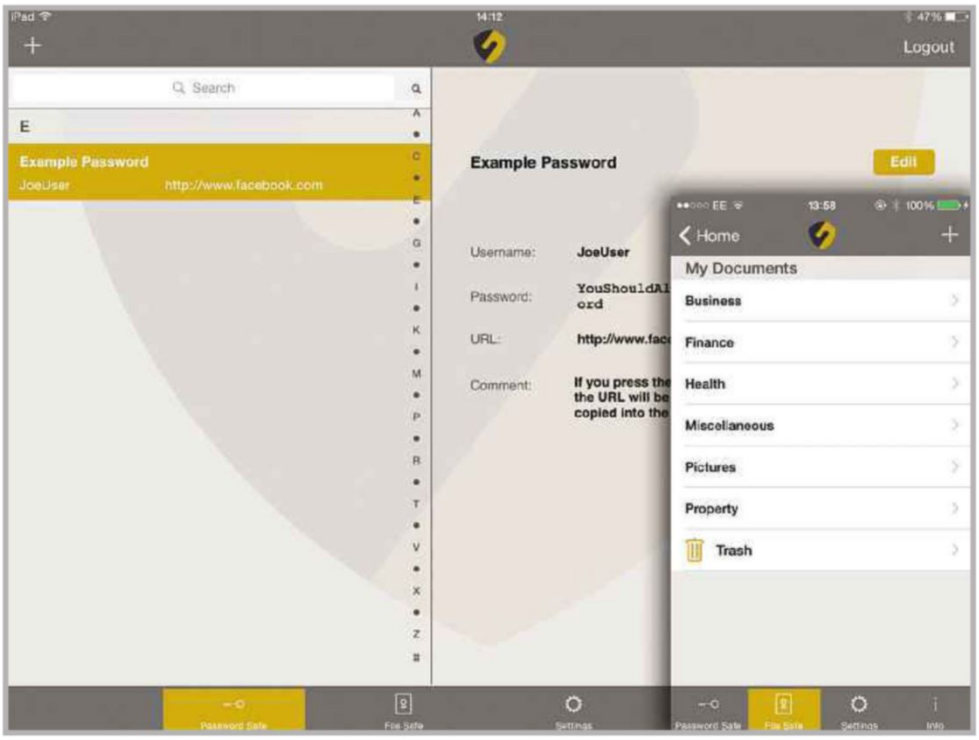
You can create only three notes without paying up too, which doesn't render that feature entirely useless (you can just type everything into a single note, we guess), but it's another silly limitation that makes our brow crease.

Rather strangely, you can also set a variety of alternative security lock-outs as an alternative to the calculator PIN, including simple number and text passcodes, as well as Android-like zigzag patterns. This somewhat defeats the raison d'etre of the app, though, because if it doesn't open to the calculator keypad, then people are going to realise there's more to the app than first appears.

Of course, it shouldn't be forgotten that you also get a calculator app! While this duplicates what's already present on an iPhone, if you



Secret Photo & Video Calculator pretends to be a calculator but actually contains a secure vault for photographs, text notes and more



SecureSafe is a nice and basic cloud app ideal for storing passwords and files up to 10MB in size

run the app in magnified mode on an iPad – which lacks a calculator – such a thing could be pretty useful in itself.

Alas, Secret Photo & Video Calculator crashed a few times in our testing, and importing more than a few photographs practically locked up the app to the extent where we had to abandon it and come back later. The iPhone also got pretty hot.

There's enough functionality in Secret Photo & Video Calculator for many to find it useful, but it comes perilously close to being trialware – and that's something Apple wanted to avoid in the app store. Everything can be unlocked for a one-off £2.99, which is reasonable, and at least the app isn't supported by ads.

SecureSafe

The cloud is here whether we want it or not, and SecureSafe leverages it to provide access to your most sensitive information from any device on which the app is installed or on the SecureSafe website. This is very convenient but, of course, many people have concerns about sensitive data being stored on cloud computers they have no control over. To negate our worries, SecureSafe point out that AES-256 and RSA-2048 encryption mean that even it own employees can't see your data. HTTPS is used for data transfer, which used to be considered safe enough, but with the Snowden revelations, nobody's quite sure any longer. Then again, it's not like there are alternatives.

You'll need to create an account to get started but, somewhat confusingly, to do so you have to tap the (i) button on the login screen and scroll down through boilerplate marketing text. Inadvertent IQ tests like this are fun but can also be frustrating.

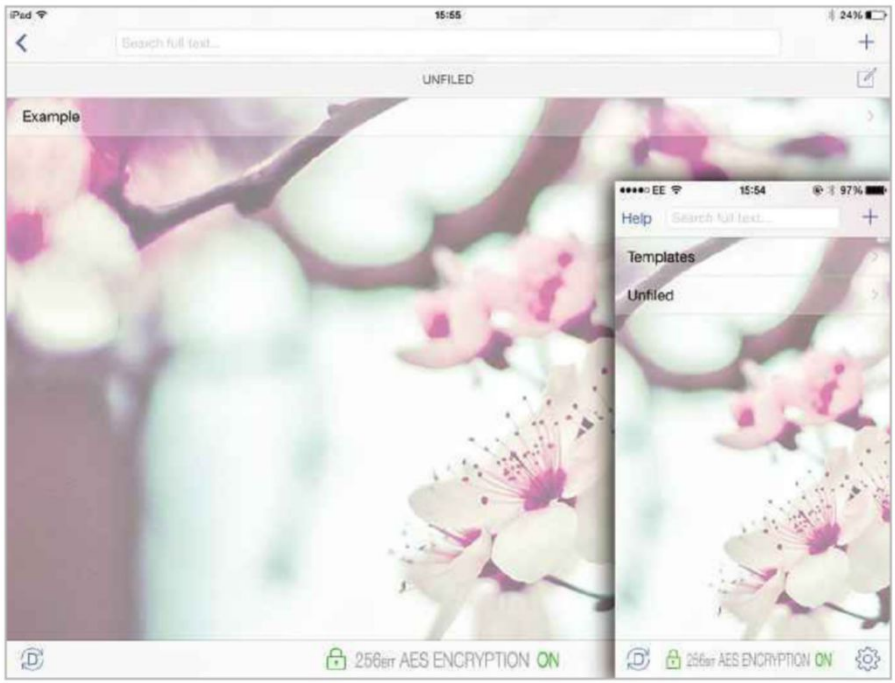
The app essentially has two components: a Password Safe and File Safe. Signing up as mentioned above lets you store up to 50 passwords, along with files of up to 10MB but not exceeding a cumulative total of 100MB (that's not a typo; it's 100MB, not 100GB – this ain't Google or Microsoft we're dealing with). Files are stored in the cloud, as are passwords, but a copy of your passwords is stored offline in case you need them when there isn't wi-fi/cellular access.

The password safe is effective but primitive; each entry requires a title, username, password and URL. You can also add a text comment. When you view the entry, a COPY button appears alongside each field, allowing you to quickly grab a password for pasting into Safari, for example. Passwords are arranged alphabetically, and a draggable alphabetical index at the right lets you move between entries. There's no Safari extension, however, so you can't insert entries straight into password fields on websites.

> **“There's enough functionality in Secret Photo & Video Calculator for many to find it useful, but it comes perilously close to being trialware”**

The file safe is similarly easy to use and by default is split into several categories: Business, Finance, Health, Picture, etc. You can add your own by tapping the plus button at the top right, where you can also opt to take a picture or video or import existing images and videos from the gallery. Getting non-picture or video files into the app means opening the file in another app (such as Dropbox), then tapping the standard iOS share button and selecting SecureSafe from the list. You can also email files to yourself via the Mail-In feature, although this first needs to be activated in the Settings panel. This will add to your vault any attachments you send, or if the email contains no attachments, then the body of the mail will be converted to a PDF and added as a file. That's pretty nifty, but we wonder why all email

Secure Vault includes just about every feature you could need, including some clever protection against sneaks



The Vault is ideal for storing secure text notes and PDFs, but everything comes via costly in-app purchases

contents aren't PDF'd anyway, regardless of attachment, especially bearing in mind certain email signatures containing images could be interpreted as attachments.

This aside, there's a lot to like in SecureSafe, which is basic but reliable and also ad-free. However, one very curious omission is the ability to create secure freeform notes.

Paying for the Pro ($1.70 per month), Silver ($4.40) or Gold ($13.20) packages brings additional benefits like two-factor authentication, file sharing and more storage space for files and passwords.

Secure Vault

Certain iOS offerings are best described as 'kitchen sink' apps, and Secure Vault is one of them. As its name suggests, its main function is to act as a secure vault, but it also includes intruder detection (recording GPS location and snapping a photo), a browser that's also capable of downloading, a variety of lock methods and a handful of other ingenious little tools here and there.

Indeed, setting up a lock method is the first task, and two are available out of the box: keypad (i.e. PIN) and a pattern zigzag style lock involving nine points. A variety of other lock methods are available for 79p each, including a faux calculator, a combination-style lock (like luggage) and even one based on the Simon game from our childhoods.

Here you can also set up a decoy lock method, which you can enter if you're ever forced to access the app under duress (yes, really). This is like a second account that you can either leave empty or fill with dummy 'innocent' content to give the appearance the app contains nothing interesting.

Getting files into the vault took more experimentation than we were anticipating. Inserting photos or videos into the vault is easy: just tap Default Album, then click the add buttons at the bottom. Getting other files in proved trickier, because there's no entry in the share sheet system that other apps use to send files to their vaults; you can't tap a file attachment in Mail and then select Secure Vault, for example. However, you can get files into the vault by connecting to iTunes on your PC or Mac and transferring them that way – a little clumsy, but it works. They'll then appear in the USB Files category. You can also log into Dropbox within the app and grab files from there.

Alas, without paying 79p for the Pro upgrade, you're limited to just three non-default albums/vault categories. On the other hand, this is the only in-app purchase aside from purchasing alternative lock methods, as mentioned earlier.

Another way to get files into the vault is to use the built-in browser to download them, in which case they appear in the Downloaded Files category. The browser is opened by tapping the WWW button at the bottom and comes complete with tabs and the ability to create bookmarks. This is arguably the strongest part of the app.

There are a handful of irritations, as there always are. There's no logout button, for example, that you might want to tap suddenly if you discover prying eyes looking over your shoulder. You can achieve the same thing by simply quitting and restarting the app or by setting a time-out in the Settings panel, but it's a bit of a pain to rely on such methods. Additionally, although the app works fine on the iPad as well as the iPhone, it only works in portrait mode on both. Grrr! There's no cloud syncing either, so each of your iOS devices has to be set up as an independent device. This is either irritating or good depending on how you feel about cloud security.

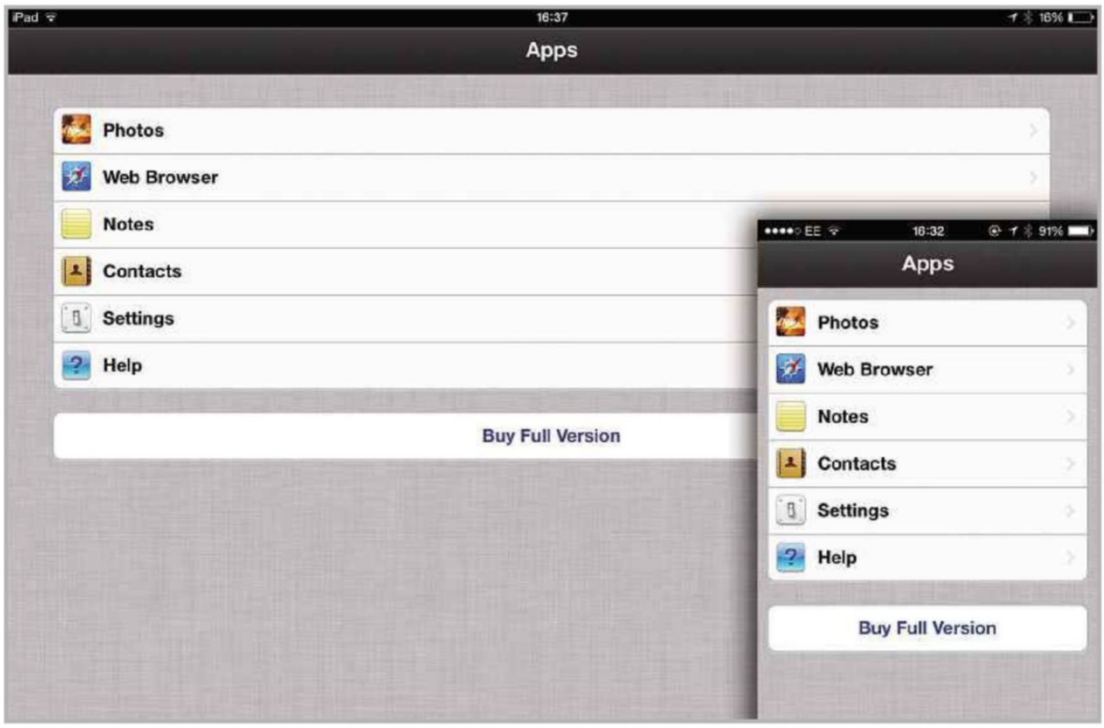
But it feels truculent pointing out the above when there are so many useful features packed into Secure Vault – provided you can put up with its eccentricities.

The Vault

Created with simplicity in mind, The Vault essentially stores two kinds of data: PDFs and notes. Notes can have pictures inserted within them and can use templates preformatted with headings for credit card details or username/password details. You can also create your own templates easily, providing the ability to store just about any kind of structured text data, such as membership card details.

The Vault is protected with 256-bit AES encryption, with the encryption key generated from a PIN you enter when setting up the app. Perhaps unusually, the PIN has to be at least five characters long, although you can also use TouchID for unlocking if your phone supports it (this needs to be activated in the Settings panel).

The company behind The Vault are so proud of the encryption that it's added a mention of it to the app's icon and mentions it at all times



Secret Apps Lite cleverly hides your file vault behind a series of apps that mirror existing iOS functionality

at the bottom of the notes/file listing. It's certainly useful, but ultimately apps of this type are mostly about blocking access to anybody who doesn't have the correct PIN, rather than securing data. Attacks are unlikely to be more sophisticated than somebody simply attempting a few PINs they think might work. However, the developer behind The Vault appears to be aware of this, and the Settings panel lets you add a timed delay whenever an incorrect PIN has been entered, making it difficult for those attempting to guess it, and you can also set the data to be destroyed after 30 failed attempts. Another setting will lock the app for an hour after ten failed attempts.

Notes are created by tapping the plus icon, where you're offered a choice of templates, or you can choose to create a basic, empty note. Pictures are inserted by tapping the button on a toolbar above the keyboard, and you can choose from your library or snap a picture there and then. With the latter, a neat arrangement of editing tools appears post-snap, even including a levels adjustment tool.

The keyboard toolbar also features a menu button showing options to create templates, share the note via the iOS sharing system, generate a new password and print the note.

Getting PDFs into the vault is done by selecting it in a different app, selecting the share button and then selecting The Vault's icon. To import more than PDFs you'll need to stump up a slightly hefty £3.99. However, that brings with it the ability to view a wide variety of file formats within the app and print them too.

Other in-app purchases include the ability to sync between devices and Dropbox, which will set you back a whopping £7.99, as well as secure backup and restore (£1.49) and the ability to import/export data (£1.49 each).

The Settings panel allows a high degree of customisation, all of which rounds off a useful app that offers just enough functionality for most of us. We'd like the ability to insert photo straight into the vault, rather than having to create a new note each time and could do without the hideous wallpaper, but these are minor complaints.

Secret Apps Lite

Taking a slightly different approach to the other apps reviewed here, Secret Apps Lite doesn't provide direct access to the vault it creates. Instead, it provides several apps (Photos, Web Browser, Notes and Contacts) that simply save invisibly to the vault, all of which are hidden behind a PIN you set up when first using the app. These apps aren't linked to the iOS apps of the same name, although you can import into the Contacts app from the main contacts database, for example, and import from your Camera Roll and Photo Streams into the Photos app.

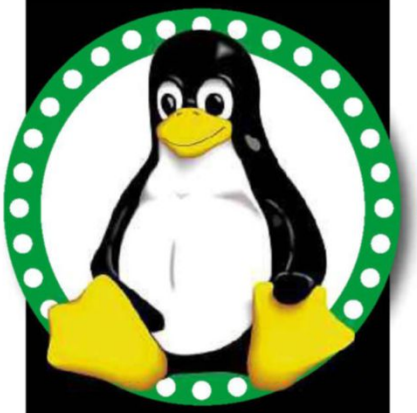
This approach keeps things nice and simple, and indeed using the app provided no problems during our testing. Secret Apps Lite isn't packed with features, but the core of what you need is present. You can create text notes, for example, but there's no way of formatting the text or inserting pictures. Tapping a field within an entry in the Contacts app will open an email or initiate a phone call, but there's no way to add thumbnail images for each contact.

In fact, the apps all work and look a lot like those found in iOS 6 and below, and it became pretty clear during testing that this app hasn't been updated recently. Still, aside from a slightly archaic look and feel, this isn't an issue if everything works correctly – and it did as far as we could tell.

Although you can pay to upgrade to the non-Lite app, we only encountered a single limitation during our testing, which was that we could only create two photo albums. However, there didn't appear to be any limitation on how many photos could be stored in individual albums, so this is only likely to annoy those who want to keep everything neatly organised. Incidentally, we don't know how much the full version costs, because tapping the button took us to a dead web page. A little hunting around online suggests it costs just 79p, which is surely worth paying if you find the app even slightly useful.

There are some nice features hidden away in the app. For example, on every login, a picture is snapped via the camera and GPS data noted too. You can view these within the Settings component. As with some other apps here, you can create a 'decoy' PIN, which will open the app to a seemingly innocent selection of files. In addition to a PIN, you can also set a zigzag pattern-style app lock.

There's much to like here, but the lack of updates is concerning, and with iOS 8 often incompatible with apps developed for it, never mind older apps, we're not sure how feasible it is to keep using this app in the coming years. **mm**



Linux At CES

Linux made quite the appearance at this year's show

David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

As most will know, the global stage for innovation, CES, has now finished doing what it does best, and the exhibitors and journalists alike are nursing their poor heads after consuming near-lethal doses of alcohol.

Among the quantum dot TVs, advanced robotics and sundry other tantalising products on show, Linux made some brief appearances in one form or another by powering many devices.

1 – Sony Walkman

A blast from the past with a modern twist, the Sony Walkman has seen renewed exposure recently thanks to the Marvel film *Guardians of the Galaxy* and increases of price for older kit on eBay.

It makes sense, then, to dust off the old Walkman and give it a new lease of life. The new Sony Walkman ZXs, powered by Android 4.2 and with 128GB of built-in storage, micro-SD card slot and wi-fi connectivity, this is no doubt a device that will attract much attention in the coming year.

2 – LG Smartwatch

Wearable technology hasn't really been adopted quite as prominently as I thought it would have by now. Some people enjoy the added benefit of having an Android watch, other not so much.

LG revealed a watch that runs WebOS – formally from HP – in a collaboration with Audi that can be used to interact with LG TVs and Audi cars. Perhaps we'll see something like Michael Knight, contacting K.I.T.T. via his watch in the near future?

3 – Samsung 4K TV

Smart TVs aren't anything new, but this Ultra HD 4K TV from Samsung is using the newly developed or, more accurately, improved Tizen as the operating system behind this new screen.

Some experts seem to think that Samsung is pitching the OS as a competitor for Google, with apps for mail and so on being run directly from the TV in conjunction with the core OS as it will appear in 2015. Whether it will or not is up to Samsung, but the TV looks nice.

4 – Panasonic 4K TV

Panasonic went one better with its 4K TV entry to CES 2015 and displayed a TV that runs with Firefox OS.

This is quite the coop, as both Mozilla and Canonical announced its TV ambitions at roughly the same time. And while there's no sign yet of an Ubuntu TV, the Firefox OS TV looks like its ready to take the world by storm.

5 – Intel Compute Stick

The big news item this year, though, is the Intel Compute Stick, a USB stick that comes with a quad-core 1.3GHz Atom CPU, 2GB of memory and 32GB of storage, and which can run Windows.

However, if Windows doesn't float your boat, Intel has also announced a Linux version with less RAM and storage, but for just $89 as opposed to $149 (prices for pounds and pence will be announced soon, apparently).

Intel Compute Stick: the future of Linux in your pocket?

Linux In The Background

While Linux may not ever rule the desktop, it has been doing a great job of backing the hardware we all use daily and take for granted.

And what's more, it looks like there's no sign of that trend slowing down either.

Cutting It A Bit Thin

With Apple's design emphasis being on making every piece of tech wafer-thin, it seems to have lost any sense of adventure

These days, if there's a common thread running through Apple, it's an obsession with thin. At every Apple event, the company's executive team bangs on about how thin its new kit is. Sometimes, this is a distraction technique: the new iPhone was heavier, taller and wider than its predecessor, but look how THIN it is! Now and again, it's because there's not much else to talk about, as per the iPad Air 2. And occasionally, you get the feeling Apple makes things thinner just because it can, as with the iMac – a machine whose thinness isn't remotely apparent unless you're looking at it mostly from the side, which, naturally, doesn't happen to be where its screen is located.

You get the feeling that if this trend continues, Jony Ive won't be satisfied until everything you can buy from the Apple Store has the thickness of a piece of paper. If you recall Steve Jobs announcing the MacBook Air by pulling it from an envelope, that'll be nothing compared to Tim Cook revealing that the new iPad Air 7 has, while he's been talking, in fact been nestled almost invisibly between two sheets of A4. And then we'll inevitably have #PaperCutGate to look forward to, as idiots attempt to see how much money they can get out of Apple by attacking themselves with their new hardware.

However, there's also another side to Apple's ongoing desire to thin the thinnest hardware that's ever thinned: it's also thinned down any sense of adventure that the company once had. Combined with Jony Ive's penchant for minimalism, Apple design is starting to have the kind of dull, vacuous beauty of a Hollywood idol. It's very clean, and you can't help but admire it, but there are no surprises any more. Maybe this is all just down to Apple essentially having a long-term plan of making the computer itself invisible – Macs and iOS devices alike may one day vanish entirely to just become paper-thin displays, and the Apple Watch would be a disc on your wrist, with any physical presence a nod to jewellery and fashion rather than the demands of technology.

But Apple users like surprises and interesting design. I recall the gasps when Steve Jobs unveiled the original iMac. Here was a computer you wouldn't want to hide away in a study; it was something that could happily live in any room. Its successor too wowed, mirroring Pixar's leaping lamp, with a screen attached to a swivelling 'neck'. But it appears this kind of thinking now resides in Apple's past, and anything remotely daring happens on the screen itself, in interfaces. Even there, Apple has a desire for minimalism, although a sense of play and experimentation is at least evident in Apple Watch's animations and the 'layered' interface of iOS.

Regarding hardware, perhaps this is why Apple concept art is making a big comeback, heightening expectations before they're inevitably demolished at an Apple event. The big example at the time of writing is the CURVED/labs Macintosh/iPad Air mash-up (**bit.ly/14vTxTp**), which is totally bonkers but oddly intriguing, mirroring the original Mac from the front but only its profile from the side, which is a thin piece of curved aluminium. It's still skinny, in a sense, but it does something different, and it's probably too quirky to have even the slightest chance of success in the market. Yet this concept art has more personality than a pile of iMacs, MacBooks and iPhones, and showcases how Apple might have been had it continued to think different rather than hone and refine largely the same concepts until there's little left to refine.

Apple design: beautiful, but increasingly soulless and bereft of personality – the thin grey line

Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find **Craig** on Twitter at **@craiggrannell**

The Shape Of Things To Come

Ian McGurren looks forward to the delights the mobile world may offer in 2015

Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

To me, the days after Christmas and New Year always feel like a particularly long day-after-a-party. Once the day is out of the way, it's very nice to have time off relaxing in the company of family, friends or whatever tech 'Father Christmas' has kindly brought you, but with opening hours all over the place and pretty much no news, reviews or other tech nuggets to digest, it tends to drag by new year. So when the rest of the world exits its post-celebratory malaise, the year can finally begin in earnest. But just what does 2015 have to offer, besides the heartbreak of missing hoverboards?

We are well into the cycle of product releases now, and can say to some certain degree that 2015 will see the release of the iPhone 6S and iPad Air 2S, the Galaxy S6 and a slew of tablets, plus bigger / better things from HTC, Sony and LG. Chances are, each of those devices will also be iterative advances on 2014's models – a 2K phone screen here, a 4K tablet screen there, faster processing and bumps in GPU power, but really the options are beginning to dwindle. To the layman, technologically speaking, it's unlikely 2015's devices will offer such a huge step in tech that people will clamber for them. This is a huge issue for the likes of Samsung, who's Galaxy Alpha and S5 didn't sell nearly as well as hoped.

The clever money may do well to look outside the processing and the screens – design is a very effective way of making a device instantly desirable. Going the opposite way, the S4-alike S5 arguably suffered, because it looked nearly the same as its forebear. Samsung may still pull one out of the hat with the S6 if it adopts the Galaxy Edge's exciting bent screen, but leaks show that the S6 is looking every bit like the S5 before it. At least the next Galaxy Tab S devices will offer the iPad a decent fight.

Then there's the eternal issue of battery. Battery capacity is one of the biggest complaints against mobile devices, especially on those with non-removable batteries, but companies have concentrated more on slim, sleek design than extra capacity in the same size. Android 5.0's project Volta has helped, and iOS devices have tiny power drain in standby pretty much nailed, but with smaller devices becoming thin to the point of being unstable (iPhone 6 Plus, Galaxy Note 4), it may finally be the time to address this pressing issue.

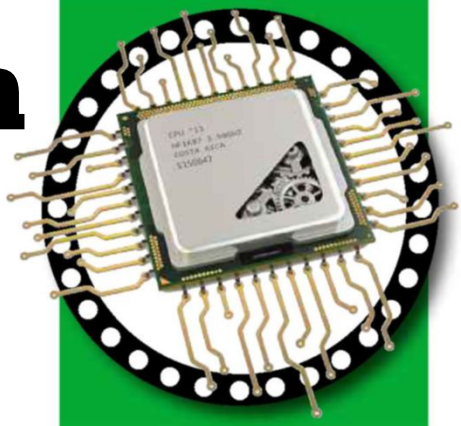
Each year will also see an update in operating systems, although out of the big three, the only one we really know much about is Microsoft's Windows 10. With its previous Windows 8/8.1 operating systems finding it very hard to make friends in the desktop sector, mostly due to its bipolar nature, Windows 10 is something of an effort to win back these users. Metro is scaled down, and back with a vengeance is the old Windows desktop. The thing is, while 8/8.1 has struggled to make friends, it's very often with those who haven't persisted with it or used it in a touch environment. Indeed, the latter half of 2014 saw Intel's Bay Trail chipset power a slew of ludicrous value for money Windows 8 tablets, with many met with acclaim. When you can get Windows 8.1 *and* a year's Office 365 licence *and* a fully functioning touchscreen computer for the same price as a Windows 8 licence alone, things become very interesting. What Windows 10 will do to this burgeoning market, however, isn't yet clear.

It has been coming for ages now, but after a few false starts, 2015 could well be the year we finally start paying for things with our phones. Contactless NFC payments with cards have grown in the last year, leading to a greater proliferation of card machines able to accept this method of payment. Then, with Apple getting in on the game with Apple Pay, it seems the stage may finally be set for us to wave our handsets to pay for things. Easy come, easy go.

Finally, is this the year we see the giants rise from the east? Could we all be clambering for Xiaomi's gorgeous and keenly priced hardware by the end of the year? That, only time can reveal.

Maybe Nvidia Can Drive Your Car

Andrew Unsworth picks a couple of his favourite announcement from CES 2015

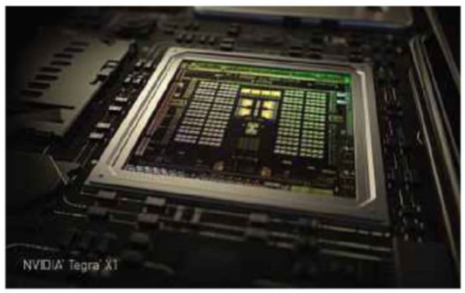


The long, cold hangover of January is a hard thing to endure, what with money being too tight to mention and the sky being dark and wet until May. Thank heavens, then, for the annual Consumer Electronics Show (CES), the place where every tech company with something to show off bares its wares. Sadly, I wasn't able to go, so I've had to enjoy the show vicariously from the comfort of an office chair.

Unsurprisingly, much of the computer hardware on show continues the trend for miniaturisation, which is essential for creating wearable or discreet devices that can be put to use in devices far removed from the IBM PC. One new release that has me excited is Nvidia's Tegra X1, a mobile chip with eight CPU cores and an impressive 256 GPU cores. The Tegra X1 is based on Nvidia's highly impressive Maxwell architecture, which has helped the graphics giant produce powerful yet remarkably efficient graphics cards, such as the GeForce GTX 750 and (my personal favourite) the great-value GeForce GTX 970. Nvidia blog editor Brian Caulfield claims the Tegra X1 "provides more power than a supercomputer the size of a suburban family home from 15 years ago" (**tinyurl.com/ntuud9w**), yet the Tegra X1's Maxwell architecture means you shouldn't need to operate your own electricity substation just to power it.

Nvidia's mobile chips are commonly used in phones and tablets, but Nvidia has chosen to show off the versatility of the Tegra X1 by developing two concept devices for the car. One concept is the Drive CX, which is designed to provide clear, beautiful graphics for car dashboards and instrument panels. The other is Drive PX, which uses two Tegra X1 processors to allow cars to operate autonomously. Apparently, Drive PX has "inputs for 12 high-resolution camera, [and] promises to make driving safer and more enjoyable by introducing Surround-Vision and Auto-Valet". Essentially, this means that Drive PX-equipped cars are capable of parking themselves, displaying a top-down, 360-degree view of the car and avoiding other cars and pedestrians, among other features. Check out the video at **youtu.be/o29TBy2a0ek**.

Not only will a Drive PX-equipped car be able to park itself in a car park, it'll be able to exit it and return to you. As a life-long fan of *Knight Rider* I find this amazing, but until all car parks have been updated to allow automatic payment through number plate recognition, your car will still need some chump on board to collect the ticket and push coins into a pay meter, and that's where the Drive PX shows the dark side of autonomous devices. By driving itself, an autonomous car relegates the on-board human to an on-board slave who must sit idle while a piece of silicon has all the fun. However, there's no doubting that a car that negates the danger of drink-driving by picking its owner up from the pub and taking them home would be a welcome thing, and I can't wait until it becomes a common sight.



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

The Game Of Life

There's a hint of David Lynch's TV classic Twin Peaks in Dontnod's episodic adventure game, Life Is Strange

This week, Ryan checks out the forthcoming episodic adventure game from the makers of Remember Me, and looks at the latest developments in Elite: Dangerous...

Plug & Play

In 2013, French developer Dontnod released *Remember Me*, an action game with a cool cyberpunk look and a clever memory manipulation mechanic. This year, it returns with an altogether different offering: *Life Is Strange*, a gentle, episodic adventure that looks like an interactive version of *Twin Peaks*.

The game introduces Maxine, a high school student who returns, after several years away, to the small Oregon town where she grew up. Reuniting with childhood friend Chloe, Maxine tries to solve the mystery of a fellow student, Rachel, who's mysteriously vanished. From the very beginning, it's clear that this isn't an ordinary high school drama; Maxine possesses the *Braid*-like ability to rewind time, and the choices the player makes through Maxine have a ripple effect on the unfolding story.

Like Telltale's hit episodic games, *Life Is Strange* will be released in five downloadable instalments, each delving further into Rachel's disappearance. What marks Dontnod's detour into adventure territory so interesting is its low-key approach to *Life Is Strange*'s story; it takes place in a recognisably average American small town, but the hand-painted aesthetic and magic hour lighting give it a dreamlike aura. This, coupled with the evident darkness implied by its central mystery – the trailer (**youtu.be/jloyb3n9FPQ**) shows us school bullies with guns and weird, cultish symbols scrawled on bathroom walls – creates an uneasy atmosphere.

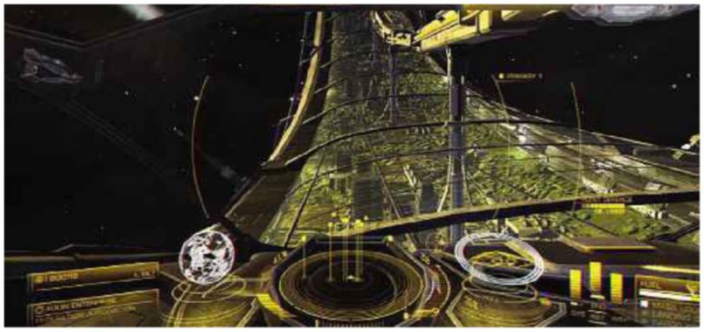
After *Remember Me*, *Life Is Strange* feels like a more personal project – the videogame equivalent of a low-budget, independent festival movie, with an emphasis on the nuances of its characters rather than on high-octane action. "It's about identity, and how we become who we are," the developers say. "Bullying, violence – we want to talk about all those social issues in the game."

That Dontnod has managed to make such an individual, unusual game made is partly thanks to its publisher Square Enix. In a recent developer diary, studio co-founder Jean-Maxime Moris said that, "Square is basically the only publisher that didn't want to change a single thing about the game. We had other publishers telling us, 'Make it a male lead character', and Square didn't even question that once."

Blacklight: Retribution Developer Closes Its Doors

Founded in 1994, Zombie Studios created an eclectic range of games over its 20 year history, from *Spec Ops* games to its most recent title, the survival horror outing *Daylight*. The studio recently made the sad announcement that it would be closing down, but there is, at least, good news for players of its most famous game, *Blacklight: Retribution*. Staff who worked on that 2011 shooter have formed Builder Box, a studio that will continue to support the game with updates in the future. "The new studio is comprised of past Zombie employees that put their hearts into *Blacklight*," Builder Box wrote on its Facebook page, "and we have no doubts will continue to do so."

➤ ***After more than 20 years, Zombie Studios is closing its doors. Its best-known game, Blacklight: Retribution, will be supported by new studio Builder Box***



New Year server problems aside, Elite: Dangerous has been well-received so far, with a 1,000 strong team of explorers currently charting its 400 billion stars

The first episode of *Life Is Strange* launches on the 30th January. We're looking forward to delving into its time-warping mysteries for ourselves.

Online

As a re-establishment of the legendary *Elite* name, *Elite: Dangerous* was a great success when it launched last December. With its colossal galaxy of around 400 billion star systems and similarly vast range of ways to make a living, Frontier's space trading sim is a more than worthy update to the 1984 original.

Understandably, perhaps, for a game of *Elite: Dangerous*' breadth, not everything's been plain sailing in its first few weeks online. Some users have been quite vocal about the absence of an offline single-player mode – something Frontier promised during the game's Kickstarter campaign – and have even taken the step of forming a campaign group to have the option put in. Frontier, meanwhile, argues that, "A fully offline experience would be unacceptably limited and static compared to the dynamic, ever unfolding experience we are delivering."

As calls for an offline mode continued to mount in the new year, *Elite: Dangerous* was beset by a series of bugs and log-in problems – something Frontier put down to a "network issue with one of our databases" – that occasionally resulted in sold items reappearing in players' inventories. Some players also found that they could turn *Elite: Dangerous*' new server bugs to their own advantage, since cargo that reappeared in their inventories could be sold over and over again.

A server rollback caused a further problem, at least from Frontier's perspective: several players logged into the game and discovered they'd been turned into overnight billionaires. On Reddit, one player said that he'd found five billion credits sitting in his wallet – a sum of money that could buy an entire armada of in-game ships and upgrades.

Initially, Frontier said that it would let players choose whether they wanted to keep their unexpected windfall, but when it quickly emerged that billionaire players were using their gains to pay off fines for bad behaviour and making life a misery for others in the universe, the studio changed its mind. The unearned billions were stripped from affected players' wallets, along with any assets they'd acquired through spending them. This, along with a recent update, will hopefully restore the game back to its earlier balance.

Such dramas aside, *Elite: Dangerous* has enjoyed a solid first few weeks, strong sales and positive reviews. What's more, players are already finding personal ways of playing the game. While some have taken on the roles of pirates and traders, others are intent on exploring the furthest reaches of its galaxy.

A group of players led by Steve Wilds has set up The First Great Expedition – an attempt to reach and chart the billions of stars and planets waiting out in the game's dark expanse. At the time of writing, Wilds has amassed more than 1,000 fellow explorers – among them astronomers and even a former scientist from NASA – who are busily coordinating their research and posting their findings on **firstexpedition.org**.

The size of *Elite: Dangerous* means that, even at 1,000 strong, The First Expedition could spend years roaming the galaxy and still only map a small percentage. That's the beauty of games like this, though: they speak to the pioneer in each of us.

Incoming

We've been following the progress of *Evolve* – the forthcoming co-op shooter from Turtle Rock, creators of *Left 4 Dead* – for some time, and with good reason. It promises to push asymmetrical multiplayer gaming exciting new directions: allowing a squad of soldiers take on a single, gigantic player-controlled alien monster, as shown in a new cinematic trailer (**youtu.be/g3D9kQEsQDg**). It gets across the frenzied combat we're hoping to find in the finished game, and that could make *Evolve* a benchmark game this year.

From the makers of Left 4 Dead comes Evolve, the four-versus-one shooter. It's out on the 10th February

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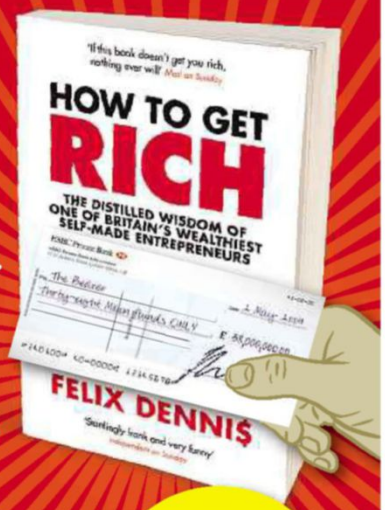

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Tel: Jeremy Gill (02089) 430683 Email: arthur.pewty1@virgin.net

Laptop DDR2 memory sale. 2 Corsair Value Select 533mhz 1GB £18 pair, 2 Hynix 800mhz 2GB £26 pair, 2 Generic 533mhz 1GB £15 pair,1 Generic 800mhz 1GB £10,1 Nanua 666mhz 1GB £, 1 Samsung 666mhz 1GB £8. Postage included
Tel: Jeremy Gill (02089) 430683 Email: arthur.pewty1@virgin.net

DDR2 memory sale. 2 x Nanua PC2 3700 256MB £6 pair, 2 x HP PC2 4200 256MB £7 pair, 4 x HP PC2 4200 512MB £10 pair or £18 for four.
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Asus M2N2-SLI Deluxe motherboard bundle. With AMD Athlon 64 4000 CPU, 4Gb Corsair ram, fan, backplate, manual, driver CD. £40
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IBM / LENOVO SFF BASEUNIT. P4 / 2.8 H-T, 2.0 gigs ram, 40 gig Hard Drive, CD-Rom, 10/100 Network, sound, USB, Clean install XP-pro, fully updated, Office Suite, Anti-Virus, & all usual utilities, COA Licence Sticker & Install media, £25
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DELL OPTIPLEX GX240 SFF. P4 / 1.6, 20 gig hard Drive, 768mb ram, CD-Rom, 10 / 100 network, Sound, Front USB, , Clean install XP-pro, fully updated, Works OK but slow by modern standards, £15.
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LG Flatron W2246S 22" monitor. Includes power and VGA leads. No dead pixels in very good condition. £50 Buyer Collects from Verwood Dorset.
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2 x 512MB PC3200 DDR400. These two sticks were removed from my working system, now redundant. £5, plus £1 p&P.
Tel: Alan (02084) 202322 Email: alan@asandco.co.uk.

2 x 1GB PC2100-648. These two matched sticks were removed from one of my redundant systems. Plus one PC2700 (DDR 333Mhz) and one 512Mb PC3200 DDR400 stick. All for £5 plus £2 P&P.
Tel: Alan (02084) 202322 Email: alan@asandco.co.uk.

Two 120GB Maxtor DiamondPlus 9 Drives plus one 80GB DiamondPlus 10. Can be supplied with two plug-in caddies. No reasonable offer refused.
Tel: Alan (02084) 202322 Email: alan@asandco.co.uk.

SANSUNG GALAXY Tab 3 for sale. 2mths old, 8gb, wifi, £80 open to offers. Willing to post at a charge.
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HP Elitebook 8760w i7 2820QM @ 2.2ghz 32GB RAM 750GB HDD Quadro 4000M GPU. Only 2 small marks on whole machine. Cost £3500 when new. £900 ONO
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Asus p8h61-mle motherboard socket 1155. Original box 1/0 cover driver disk manual together with Celeron 91620 dual core CPU and 4 9195 pc1300 memory. Working fine. No fan. £70 + free postage.
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Toshiba Satellite SA60 laptop. Model PSA60E-092058EN.Windows XP Home Edition with Certificate of Authenticity. For spares or repair - broken power connector on mobo. No power cord. Otherwise very good condition.
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Toshiba C500D-B-11 laptop. Virtually new cost £279 will accept £150 O.N.O.
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Apple Touch 32 GB iPod. Virtually new cost £199 will accept £100 O.N.O
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Intel 3930K processor. Used, but not overclocked. No box or fan. £220 ono. Will ship to UK address.
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2 HP Laserjet 3100 printer-fax-copier-scanners. In good working order. £25 each.
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2 x 512MB PC3200 DDR400. These two sticks were removed from my working system, now redundant. £5, plus £1 p&P.
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2 x 1GB PC2100-648. These two matched sticks were removed from one of my redundant systems. Plus one PC2700 (DDR 333Mhz) and one 512Mb PC3200 DDR400 stick. All for £5 plus £2 P&P.
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Two 120GB Maxtor DiamondPlus 9 Drives plus one 80GB DiamondPlus 10. Can be supplied with two plug-in caddies. No reasonable offer refused.
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HP 4Gb memory Microserver with two hard disc drives. £110. One with Linux MINT. Other with Linux FreeNAS. This will also run Windows 7 and Windows Server or Home Server. (Win 8 I've not tried it) Two spare HD slots with appropriate caddies. Slot for your SATA DVD drive also, (or use external usb or DVD drive if needed. 4 usb sockets on front, 2 on rear. VGA, network, power sockets on rear. Supplied in original HP box with CD and leaflets etc. Collect from Harrogate, North Yorks, or posted via Hermes for £12 (or less if I can do it). Cash on inspection and collection. (Highlands and Islands might obviously cost more on delivery)
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400GB IDE drive 3.5 inch formatted ready for use. Only £20 plus £3 for p&p. I can load genuine XP Professional from Microsoft with genuine certificate of authenticity for an extra £10. Refurbished.
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Dell Inspiron 660 Intel i5 QUAD CORE with ACER 23 Inch LED monitor. AS NEW. Operating System: Windows 8.1. MPN:620MT. Memory (RAM): 4 GB. Hard Drive: 1 TB. Processor Type: Intel Core i5. Primary Drive: Optical DVD+/-RW, Processor Speed: 3.0 GHz, Features: Graphics Card GT620 1GB. Acer LED monitor 23" HD. £520
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Panasonic KX-P7105 mono laser duplex printer. Some toner left. Up to Windows XP only - hence £25. Buyer collects from N2, East Finchley
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INKJET CARTRIDGES suitable for Epson Printers T711 - T714 range, and T481 - T486 range. 79 pence each, plus postage. Work perfectly, good crisp printing quality.
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Wanted: HD 3850 Graphics card, must be AGP.
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Tel: (07794) 528857 Email: it_central@ntlworld.com

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Contact Aaron by email at:
aaron@micromart.co.uk

Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

Sandbox Phishing

May I firstly wish you and all the *Micro Mart* readership a Happy and safe New Year. With that sentiment in mind I am hoping that you can advise on a problem that I am having with increased phishing events showing up in BitDefender Internet Security 2015 running on our three Windows 8.1 systems at home, please?

I use Firefox as the browser on all systems which are all up to date. It is as if the browser is being rinsed through intermediate websites prior to arriving at the desired URL. I have managed to stop the events by installing Sandboxie (as mentioned in the last issue) and running Firefox within it. However, is there any way that I can switch on the Bitdefender Wallet feature within the sandboxed browser please? Any advice would be greatly appreciated.

Paul Williams

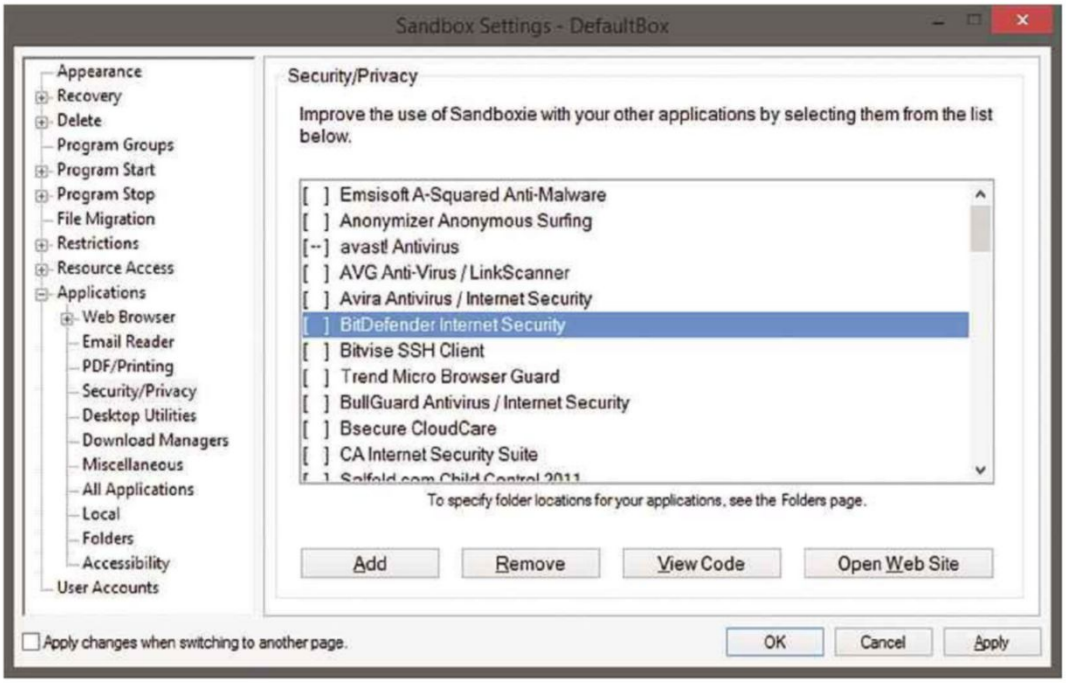
The problem you have here is down to Sandboxie's overall goal. By design, it isolates programs run within it, keeping them separate to the rest of the OS in order to prevent any security problems. This means that running Firefox within it effectively cuts off BitDefender's add-on, meaning it can't launch within the browser when it's run in a sandboxed mode, so the BitDefender Wallet password manager isn't available.

However, you may be able to get around this by specifying additional programs and add-ons that the sandbox can access. To do this, open up the Sandboxie Manager app and right-click on your browser sandbox, then select Sandbox Settings. In the left-hand list, browse to Applications and expand it, then expand Web Browser, Firefox, and highlight Add-ons. In the right-hand box you'll see various add-ons that can be included, and this may include BitDefender Wallet.

If it doesn't, in the left-hand list, browse down to both Security/Privacy, and All Applications and check within these lists. You should certainly find BitDefender Internet Security within the Security/Privacy section, so ensure this is selected, so it can have access to the sandboxed area. This should now let you access your stored passwords via the BitDefender Wallet as usual.

As well as taking these steps, also make sure you're running the latest version of Sandboxie, as new versions of security software, including BitDefender, have caused problems with older versions in the past. Some users have reported successful outcomes by using the latest beta version of Sandboxie, so this may be a possible option if you continue to have these sorts of problems.

> **Specify additional programs and add-ons that the sandbox can access**



To give programs and security apps access to a sandbox in Sandboxie, be sure to specify access rights

GPT And Garbage

After your helpful advise about UEFI and the GUID Partition Table I've successfully got up and running with my UEFI BIOS motherboard and a hard drive.

My concern is that if I try to use an SSD with Windows 8.1 neither the Windows Trim command nor the SSD manufacturer's garbage collection system will work correctly with the operating system on a GPT Partition style. Have you any suggestions?

After hours of Googling, I've established:

- Samsung has Magician v4.5, which claims to work with MBR & GPT but sounds a bit vague.
- Intel says use SSD only for data drives and not for an OS
- Crucial tell me its garbage collection will not work with GPT
- All other SSD manufacturer web sites very quiet on GPT

Could Windows 10 possibly cater for GPT trimming?

Beryl

The reliability of GPT and garbage collection isn't perfect, clearly demonstrated with various manufacturers being less than clear about it, and as GPT is still a relatively new technology, MBR is still seen as the most reliable by a lot of people.

If a drive manufacturer informs you that GPT will be a problem, then simply stay clear of that drive if you really want to use GPT. Sometimes, however, this will be more a case of covering bases. A drive may well work, but there's simply no guarantee and the manufacturer does not want to be seen to be offering one to its customers.

Intel's statement of using SSD only for data is odd, as many would argue the opposite is true, and using SSD for the OS and traditional drive for data is better, especially when it comes to cost, as an OS drive doesn't need to be as large. For optimal data access speeds, though, Intel's suggestion would work well.

GPT is often considered to be better for larger, 3TB+ hard disks (due to GPT's larger partition sizes), while MBR is used for smaller drives, especially for the OS. For most home users, MBR is still perfectly fine, and easier to use.

Still, on my travels, I've seen than many users do use SSD drives with GPT and have no problems, including Samsung models. A key is to ensure you're running the drive in AHCI or RAID mode, otherwise TRIM will certainly have problems.

1704

I keep getting an error '1704' when trying to install programs, meaning that I can't install what I want. The error mentions that application support is suspended, and that I have to undo changes before I can continue. I don't actually know what changes it's talking about, though.

Do you know what's going on here, and if there's a way to fix it? I'd appreciate an easy fix if you can, as I'm hardly a computer whiz, and still struggle with basic Windows settings, let alone technical stuff.

Geoff

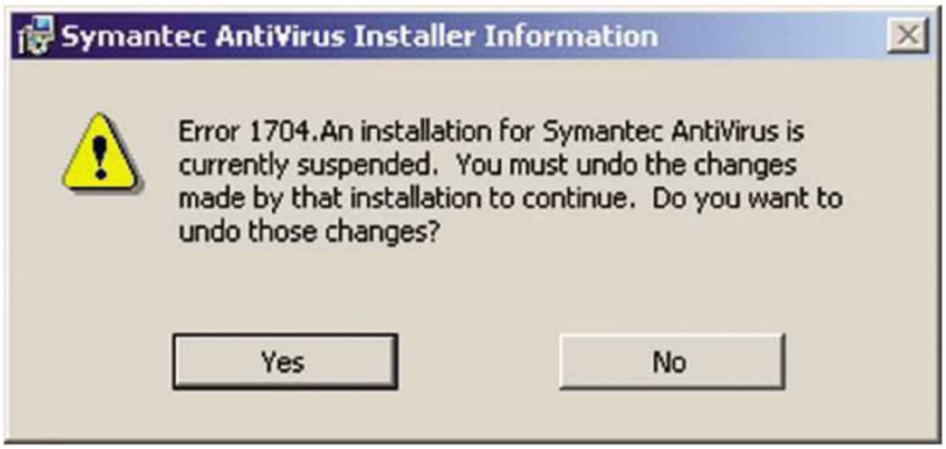
The error you're getting relates to a problem with the Microsoft Installer (MSI), and it can arise if such a program has not been correctly uninstalled previously, throwing off the MSI engine for everything you try to add thereafter.

There is a simple fix you can download and run to remedy the problem, and you can get this from ***tinyurl.com/67zvdb****. Be aware, however, that this is a third party solution to the issue at hand, and as it makes changes to your system, you run it at your own risk.*

Another solution used by users to remedy this kind of problem is to use a registry cleaner (as the error is caused by problems within the Windows registry). As always, I advise caution here, as registry cleaners can be very useful, and can fix problems, but they're also quite touchy, and can also cause additional problems in rare cases. That old mantra of backup before you proceed is important to adhere to.

This error can relate to multiple programs (which use the Microsoft Installer), however, and it often mentions MS Office. As such, it's a good idea to try a repair install of Office too if your 1704 error mentioned it specifically, and you have the suite installed. Certainly give this a go, as the registry entries for Office are likely the cause.

The 1704 error is quite common, and can relate to many programs, but always centres around the Microsoft Installer (MSI)



ASK JASON

Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

Send your questions to:
Jason D'Allison
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Jason by email at:
jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Chipset Fret

I've bought a Gigabyte GA-Z97X-Gaming G1 motherboard as the base for a new PC, and I'm startled to see that Gigabyte has used a Marvell controller for four of the ten SATA ports. In this day and age? Why not use two Intel controllers or two Marvell controllers? Is there a cost-saving, or does the Marvell controller offer some advantage? It all means I'll have to install more drivers – such a pain! Actually, if the Marvell ports aren't going to be used, can the driver for that just be ignored?

David Edwards, TalkTalk

*Motherboards have traditionally featured a northbridge and a southbridge – a chipset. These days, the northbridge (essentially the memory controller and the link to the graphics slot) is built into the CPU, leaving only the southbridge on the motherboard. There *has* to be a southbridge – the CPU won't function without one. Your Gigabyte uses Intel's Z97, which houses the controllers or interfaces for USB, LAN, audio, and PCI-E and SATA.*

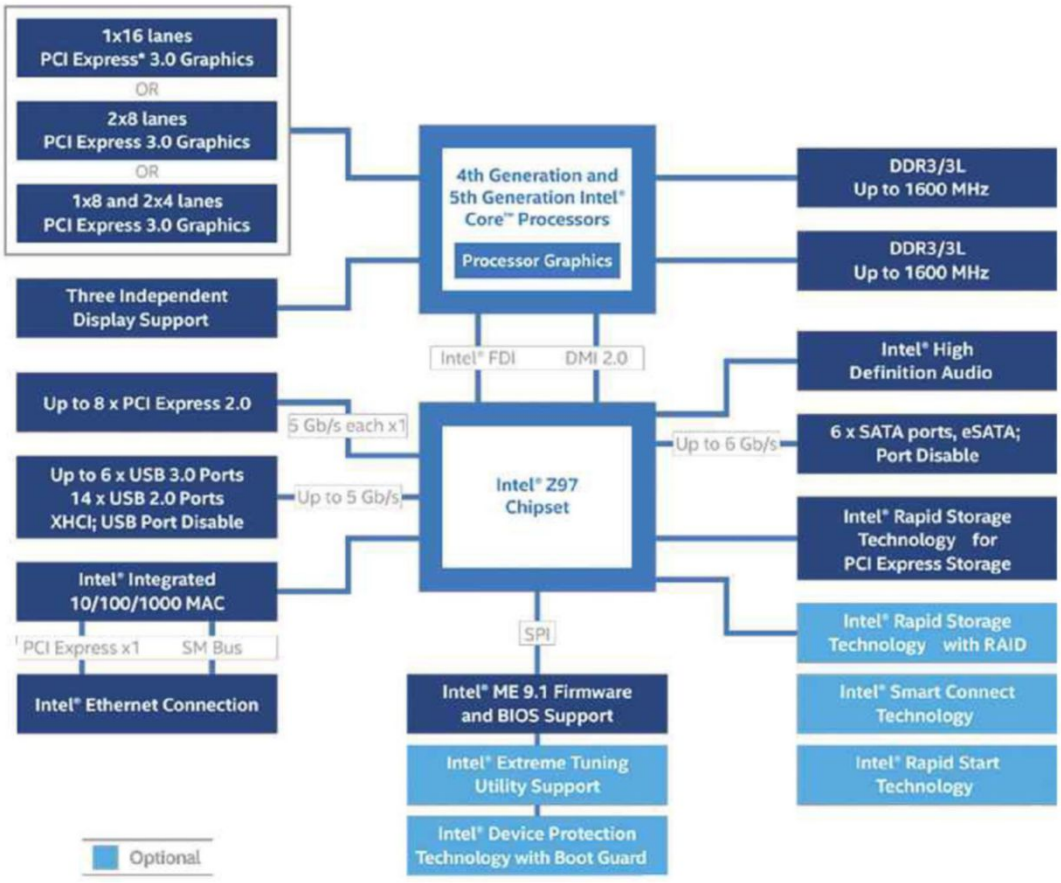
It provides for six SATA ports, and for most users those would be ample (no Intel chipset supports more than that), but as the GA-Z97X-Gaming G1 is an enthusiasts' board, Gigabyte has elected to bolt on an additional four. These can only come from a secondary controller. Intel doesn't make separate SATA controllers, so Gigabyte's gone with Marvell (a leading brand).

"Intel doesn't make separate SATA controllers, so Gigabyte's gone with Marvell"

Will some ports be better than others? Well, all ten support SATA 3.0, but historically it was always better to use ports directly linked to the chipset. In theory, extra lag could be introduced in ports connected via a PCI or PCI-E link (the latter in the case of the Marvell controller), but these days I doubt that's true.

You should install the driver, though, Dave. Few things are more annoying than exclamation marks in Device Manager, and every time the PC were switched on you'd probably get nagged about 'new' hardware. The driver won't really use any resources, but if it comes bundled with RAID or configuration software, you'd do well to stop that from auto-running.

As is the trend with most things silicon-based, motherboard 'chipsets' (now usually just a single chip) continue to cram in ever-increasing numbers of features



Mind The Gap

My PC's just over a year old. The hard drive's a 2TB unit and, as I like to keep things healthy, I run Defraggler quarterly. Before the last go-round, it reported 967 fragmented files covering 21GB, with 5,472 total fragments and 20% total fragmentation. At the end, it reported 47 fragmented files covering 20.7GB, with 119 total fragments and 19% total fragmentation. Why didn't it clear everything? Also, why does Windows 8.1's built-in tool report 0% fragmentation? Or am I worrying unduly or even just wasting my time with the whole exercise?

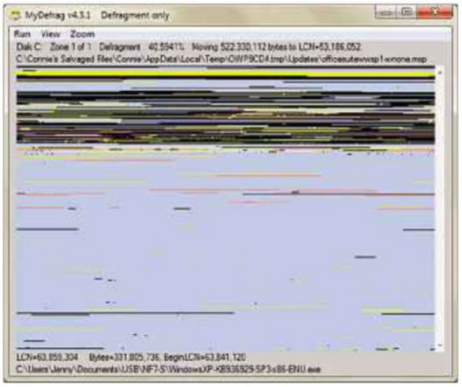
George Ash, Outlook.com

You could well be wasting your time, George. Significant fragmentation will only have occurred since your last defrag session if you've ditched tons of programs and files and put tons of new stuff in their place. Under ordinary usage, a hard drive shouldn't need defragging more than once a year at most. What's more, unless a drive really is in a right almighty mess, defragging rarely makes much difference to performance. It also causes wear and tear.

In your case, Defraggler appears to have done its job okay, as all your numbers have gone down. Why's the drive still 19% fragmented? Well, as the non-optimised 20.7GB comprises only 47 files, my guess is you've got a load of big videos. My other guess is that there's not enough free space for Defraggler to juggle the parts around and join them back together. Have I hit the target? Of course, that doesn't explain why Windows' own defrag tool reports 0% fragmentation, but quite frankly nothing about Windows 8.x surprises me any more.

Although Defraggler often tops the charts in reviews of defrag software, personally it's regularly failed to do the business for me. Its results don't always make sense – perhaps just as you've found! Give MyDefrag a punt – download it from ***bit.do/X4dv.*** *It's small, light, and 'just works'.*

MyDefrag is a terrifically small and terrifically effective disk defragger (not suitable for SSDs)



Not So Smart?

In recent times I've noticed a gradual shift in focus in computing magazines, a shift away from PCs and towards smartphones and tablets. I own both a smartphone and a tablet, but I still prefer my desktop, with its overclocked Core i5-2500K, and my Core i7 laptop. I don't believe I'm alone in such a preference.

Is there any hope for rig-builders like myself? I still love the thrill of putting together a new machine. Sandy Bridge K CPUs, such as my i5-2500K, really shook up the market, but years later there's still nothing worthy of an upgrade. *Micro Mart* quite rightly states that an SSD is the best upgrade anyone can make.

I can't help but think that AMD and Intel are missing a trick by concentrating on integrated graphics instead of CPU speed. Gamers will always opt for a dedicated GPU, and professionals will always opt for a fast CPU. So what strategy are they working to, exactly? How do you see the next few years panning out?

Alan Clough, Gmail

In the years that followed Windows 95, PCs went mainstream and every man, woman, girl, boy, and goldfish wanted one. First it was desktops, then, as prices fell, it was laptops. But now most people have come to realise that 99% of their usage boils down to accessing the web and consuming media. Tablets and big phones fit the bill – and they're more portable and often cheaper, too.

The desktop isn't dead, but sales are limited to gamers, enthusiasts, media-based professionals, and businesses. Business sales were once the biggy, but many office workers are now being equipped with laptops or thin clients. Laptops remain reasonable sellers with home users, as there'll always be people who need to complete coursework or write job applications – or who just can't get to grips with touchscreens. Desktops, however, simply aren't mainstream any more. They're niche products.

Consider this, Alan. A phone or tablet CPU five years ago delivered about 2,000 DMIPS (1GHz single-core Cortex-A8); today we're looking at more than 40,000 DMIPS (1.9GHz quad-core Cortex-A57 + 1.3GHz quad-core Cortex-A53). That's a twenty-fold increase. A phone or tablet GPU five years ago delivered about 3.2 GFLOPS (200MHz PowerVR SGX540); right now we're seeing over 1,000 GFLOPS (1GHz Tegra X1). That's more than a 300-fold increase!

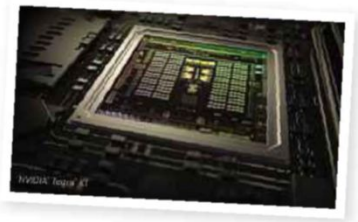
Looking at the desktop, a Core i7-4790K (June 2014) is only about 50% quicker than a Core i7-975 Extreme Edition (June 2009). In the last five years, then, there's not even been a two-fold increase. Desktop GPUs have seen greater improvements, but we're talking about a four-fold increase at best. There's unquestionably been a slowdown.

Necessity is the mother of invention. Writing shopping lists in Word or watching cat videos on YouTube can be done just as well on a Core 2 Duo PC from nearly a decade ago as it can on a PC built today. Desktops and laptops are only being upgraded when they break. So where's the incentive for Intel to pour billions of dollars into PC R&D? Intel's money is following the buyer's money: mobile.

Another factor is lack of competition. In the GPU market, AMD battles tooth-and-nail with Nvidia, keeping the market healthy, but when it comes to high-performance CPUs, AMD hasn't had parity with Intel for years. In fact, it's given up trying. Why would Intel pull out all the stops when nothing's snapping at its heels?

Looking ahead, Alan, I think PC evolution will continue to stagnate. However, server markets are always demanding greater power-efficiency, which is a shared goal with phone and tablet markets. So improvements are bound to trickle down to PCs. Expect smaller, quieter systems, hopefully without loss of the open, kit-like flexibility we've come to love. I think PC performance will see only iterative gains, but the advances in power-efficiency could mean the grunt of a gaming PC in 2015 could well be inside phones and tablets not long after 2020.

Nvidia's new Tegra X1 mobile SoC has a TDP of just 5W but packs an octa-core 64-bit CPU and a GPU with the performance of a GeForce GT 740



Crowdfunding Corner

Home technology is evolving, and Kickstarter is helping it happen with two projects that look to be the next big thing in their respective fields

Zettaly Avy

Now that everyone's got themselves a smart TV, smart speakers are apparently going to be the next big thing – at least if you pay attention to the trends that dominated CES this year. The Zettaly Avy is an Android-powered smart speaker that can access streaming services to play music, and even use its screen to show videos and movies if you're so inclined.

The hardware includes dual 5W speakers, a 1024 x 600 7" touchscreen and wi-fi/Bluetooth connectivity. It's designed as a household entertainment device, but it's small enough to take with your wherever you go, and its offline capabilities and rechargeable battery mean you can use it anywhere. It even runs on Android Lollipop so you can have access to the latest features. There's even an HDMI-out port so that you can connect to a full-size screen.

Available in either 8GB or 32GB models, in black or white, early-bird backers can receive the basic unit for $129 – $40 off the post-Kickstarter pre-order price. You can get the 32GB Avy Pro under a similar deal for $169, but that's $60 off the post-Kickstarter price. It looks like a great piece of hardware and that price is definitely right, so why not take a look?

With over a month to go at time of writing, it's already two-thirds towards its $50,000 target, which means it's likely to meet the goal with plenty of time to go.

URL: kck.st/1DDsdlu
Funding Ends: Friday, February 13th 2015

XG Virtual Reality Headset

Want a VR headset that's cheaper than an Oculus Rift but less temporary than Google Cardboard? How about the XG Virtual Reality Headset, a head-mounted bracket that adopts the Cardboard approach of using your smartphone to create a VR experience that's almost as good as expensive hardware doing the same job.

Unlike other headset concepts, though, the XG VR is designed to take almost any phone you like, pretty much regardless of its size and shape. Its magnifying lenses are anti-reflective and anti-smear, and there's an interchangeable foam pad to ensure that you achieve a comfortable fit. The kit even comes with a Bluetooth button to help you activate and deactivate your phone while it's locked in place.

Backers can get a prototype "I Am Cardboard" kit for $15, a clicker on its own for $20 and an early bird version of the headset for $59 (if you're quick). If you miss that offer, there's still the chance for a Kickstarter version of the headset for $69 in a variety of colours, so there shouldn't be any difficulty picking one up. Delivery is planned to be complete for June 2015, so there's a good chance you'll be enjoying some pseudo-VR fun before the summer has even started, even allowing for some inevitable slippage.

URL: kck.st/1IGZqe7
Funding Ends: Saturday, February 28th 2015

Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

MiniTool Partition Wizard 8

David Hayward looks at an excellent disk management tool for all techies

There are countless partitioning toolkits and programs. While some aren't worth the bandwidth needed to download them, and are often riddled with adware and toolbars, some are quite exceptional. MiniTool Partition Wizard 8 (which we'll call MPW8 from now on) definitely falls into the latter category.

A wizard at partitioning

Simplicity and usefulness are the key to a good partitioning program, and this software has both attributes in abundance. Installation is a breeze, and thankfully free of anything untoward, and the main user interface is free from clutter and unnecessary extras.

As with most tools of this nature the main UI is split into sections. The larger portion of the screen is taken up with the current installed drive and disk information, with an added banner along the top displaying the current partitions, while the left side offers a collection of built-in tools, such as Copy Partition Wizard, Copy Disk Wizard, Rebuild MBR, Surface Test and so on. Finally, the upper part of the UI houses the various menus and icons that allow you to apply a change, undo anything and to access the properties of the currently selected disk or partition.

MPW8, as with some of the more professional level partitioning programs available, will queue any changes you've decided to make to your current setup before allowing you apply the changes. This gives you the opportunity to review the changes you want to make, and the ability to back out of anything should you have made an error.

The Copy Partition and Copy Disk Wizards are particularly good. In fact they are the fastest ways to clone whole drives and partitions that we've come across so far; which is saying something, as we use cloning tools quite frequently.

Furthermore, the Rebuild MBR feature and the facility to download the MPW8 Bootable CD image make it an absolute must for any technician's toolkit of programs and applications. As are the ability to resize, move, split, create or securely wipe any detected partitions on any of the installed and selected drives in the system.

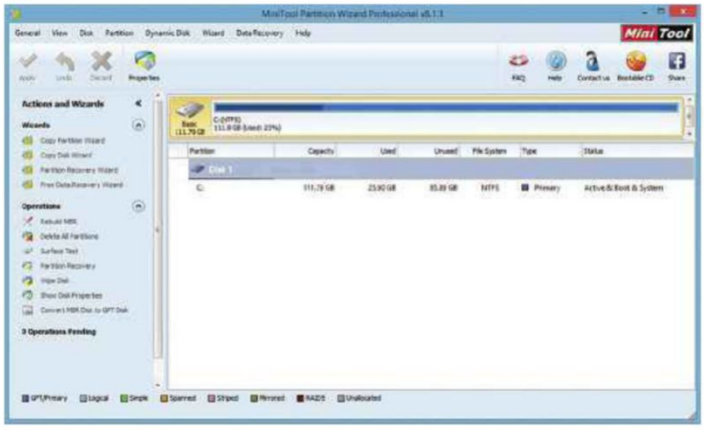
The free Home Edition of MPW8 covers most of the tasks you would normally require from a program of this kind, plus a number of other elements that you wouldn't find on other free tools. The Professional version, however, improves it use through the addition of Merge Partition, Change Cluster size, Resize and Move Dynamic Volumes, Delete and Format Dynamic volumes, and much more. For around £25 it's certainly a worthwhile buy if you think these features will come in handy – and you can even upgrade to the more capable and feature-laden versions (Server, Enterprise, and Technician versions) should your needs expand further on.

Conclusion

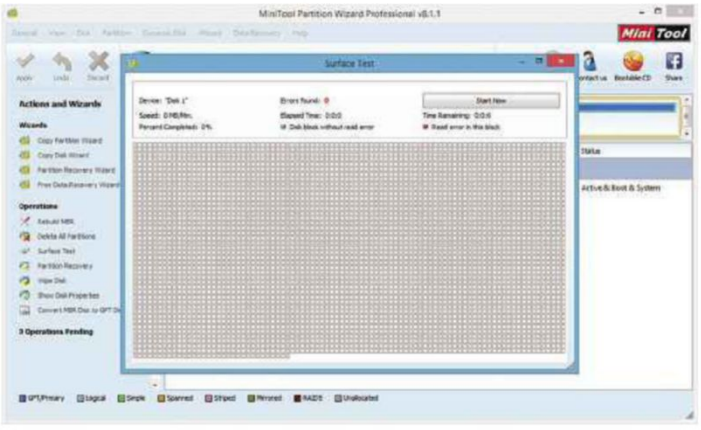
MPW8 is a handy program to have at your disposal. Its Professional version cleverly expands on its foundations, making it even more worthwhile – and almost essential – for those who tackle regular drive and partition issues.

Features At A Glance

- Ability to fully manage your partitions and disks
- UEFI boot supported.
- Perfect for technicians of all levels – the free version is excellent, Professional version is even better



MiniTool Partition Wizard 8 Pro Edition has now become our favourite disk management tool



There are numerous handy features you will probably find useful in both the free and Pro editions

Logging Off

I know that 2015 is still relatively young, but my mind has been wandering to Windows 10 already – specifically how that might bring back to Microsoft a greater say in the computing agenda than it has right now.

There isn't any way to dress that up than anything other than a tall order, because while Microsoft flailed around snarling at anyone who suggested that Windows 8 wasn't inspired, the world moved on.

Critically, as a tech culture we're now firmly OS agnostic and don't really care how we tweet, share, mail or browse, as long as it happens. The notion that you need Windows to do real work has been utterly debunked, and even Apple is getting a lesson in market penetration from Google.

Having for decades been the major player, Microsoft now gets to experience what companies going up against it over those years did, ironically. But – and a reality check is always worth the time – there are still more than a billion Windows users, and many of those are using versions of the OS that are more seven years old or more.

Surely, if you can't convert those into repeat customers, you really need to shut the whole business down? However, that's what Microsoft has been doing so far.

In gambling terms, Windows 10 represents putting all the chips on red and watching the wheel spin, because a repeat OS failure could be catastrophic for the company.

Given the importance of it, I'm already starting to get nervous about Windows 10, because I've yet to hear one single thing about it that is exciting or even slightly compelling.

If it takes Microsoft three years to put back a feature, the Start menu, then it will be quite rightly pilloried in the technical press.

It's already been taken to task about how it's taken the innovative way OneDrive works under Windows 8 and butchered it to being much less clever in the Windows 10 preview. Other than that and the dubious promise of Cortana, a new browser to go alongside IE and some esoteric Azure-related changes, the new features cupboard seems remarkably bare so far.

Maybe when the public preview arrives I'll get to eat these words, but at this time the excitement about this new OS release appears to have evaporated. The trouble with interpreting this for the likes of a tech journalist is that Microsoft's inability to communicate is legend. It is at least a contributory factor in me

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Dennis Publishing
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London
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Tel: 020 7907 6000
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PRINTING
Printed By: BGP
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having made a living trying to decode its painfully mixed messages.

The latest carefully crafted leaks in regard to the Spartan browser (yes, another Halo reference, yawn) effectively confused many people, even those close to Microsoft. Apparently, the new browser will have lots of features that Chrome and Firefox don't have, and some they do, and it won't actually replace IE but work alongside it. Eh?

On Windows 8, you have two versions of IE, one for Metro and one for desktop Windows, so presumably you'll also have two versions of Spartan too? That's four browsers before you've loaded the one most people use.

As the new *Star Wars* film will come out just after Window 10 is likely to appear in retail, I can only say that at this time: I have a bad feeling about this.

Mark Pickavance

LAST WEEK'S CROSSWORD

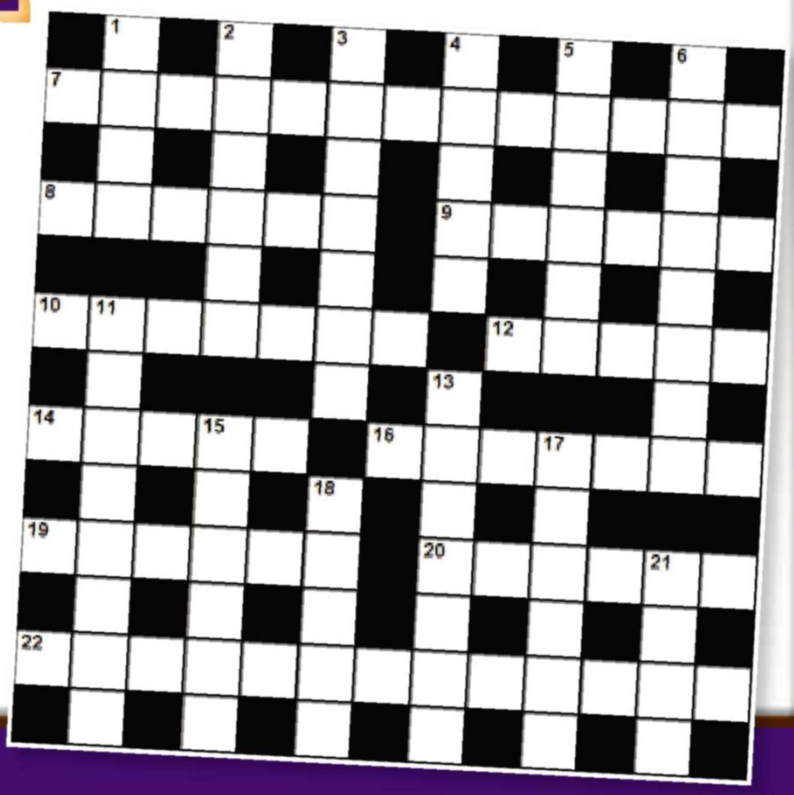
Across: **7** Administrator, **8** Markup, **9** Newton, **10** Caliper, **12** Inert, **14** Glare, **16** Tsunami, **19** Enigma, **20** Lowell, **22** Veitch Diagram.
Down: **1** Idea, **2** Nikkei, **3** Simplex, **4** STING, **5** Taiwan, **6** Monogram, **11** Allen Key, **13** Psyllid, **15** Rights, **17** New Age, **18** Pathé, **21** Load.

DISCLAIMER
The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. One of our favourite things about Netflix is that it gives you access to a fine array of well-made, intriguing documentaries. It's also home to *Aliens on the Moon: The Truth Exposed*. To be honest, we get the feeling it's meant to be a joke, but it's not funny, and everyone in it appears to be utterly convinced that aliens built satellite dishes on Earth's moon, as well as space stations and a branch of KFC. Well, actually we made that last one up, but you get the point – the point being that this 'documentary' is complete tosh. However, it does feature second man on the moon Buzz Lightyear – sorry, Aldrin – talking about the time he saw a UFO when he was in space. Mr Aldrin also says that it definitely wasn't aliens, but why let the truth get in the way of a good story (or, for that matter, a terrible one)? In his interview, he simply states it was a flying object that he couldn't identify, hence the name 'UFO'. That's a good point, isn't it? Surely the instant you identify something as an alien spaceship, it's not unidentified any more, so it can't be a UFO, can it? Anyway, the truth, as they say, is out there. It's just not in this film.

THIS WEEK'S CROSSWORD

Across
7 Stargazing through the detection and measurement of high-energy electromagnetic radiation emitted by celestial objects. (1-3,9)
8 A bond, deed or other document kept in the custody of a third party and taking effect only when a specified condition has been fulfilled. (6)
9 Taiwanese manufacturer of electro-optical devices including scanners, digital cameras and video equipment. (6)
10 The SI unit of luminous intensity. (7)
12 The measure of the inclination of one line or surface with respect to another. (5)
14 Encrypted image file extension. (5)
16 Expose to ridicule or public scorn. (7)
19 Manufacturer of the Tizona, Durandal and Colada gaming keyboards. (6)
20 AMD named this FM2+ processor after an Indian river. (6)
22 An industrial method of obtaining sodium carbonate from limestone, ammonia and brine. (6,7)

Down
1 An ambiguous colour term, usually referring to shades ranging from blue-violet to violet. (4)
2 A word that is composed of parts from different languages. (6)
3 Nobel Prize winning German chemist who established physical chemistry as a separate discipline. (1853-1932) (7)
4 A type of solderless connection for wiring. (5)
5 Two or more sounds or tones at the same pitch or in octaves. (6)
6 A rotor used to increase or decrease the pressure and flow of a fluid. (8)
11 English physicist best remembered for his studies of the ionosphere (1892-1966) (8)
13 Criminals who cheat traders out of what is due, especially from petrol stations. (7)
15 A settled and monotonous routine that is hard to escape. (6)
17 A version of Linux that can run directly from an optical disc without having to be installed on a PC first. (6)
18 Of or denoting an alkyl radical –C9H19, derived from nonane. (5)
21 A coarse file with sharp pointed projections. (4)



The Things That Frustrate Us About... Blu-ray

It won the high-definition format war and lets you see your favourite movies in much greater detail than before, but is Blu-ray too annoying to be worthwhile?

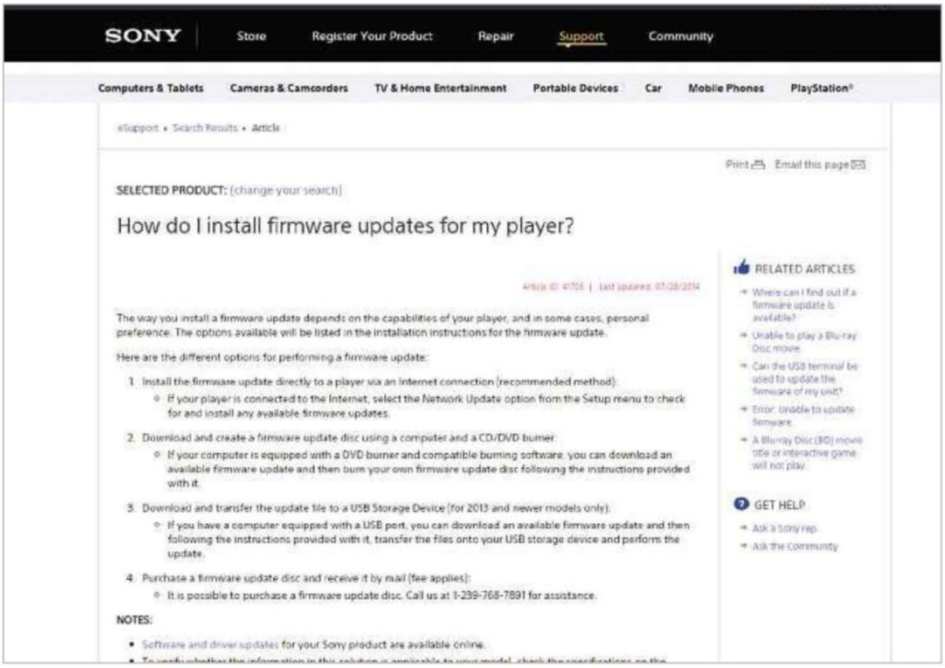
The introduction of Blu-ray should have been a game changer for the home entertainment market. In the same way that DVD was a huge step up from VHS, Blu-ray should have been a huge step up from DVD. And purely in terms of image quality, it is: films on Blu-ray look brighter, sharper and more detailed than ever before. But Blu-ray hasn't quite taken off in the way DVD did, and there are probably loads of reasons for that. Streaming has become much more popular, for one thing, with services like Netflix giving us access to more movies than we'd ever have time to watch without taking up any storage space whatsoever.

And then there's the price and the fact that Blu-ray took a while to win out over HD DVD and that, well, the economy collapsed, and perhaps people don't have as much money to spend on entertainment as Blu-ray peddlers might hope. But if you have invested in a Blu-ray player and started upgrading your movie and TV collection, you might also have noticed these niggles…

Argh! Updates?!

We've all got used to periodically updating our PC's operating systems, as annoying as it is to wait for all the updates to install. And we've pretty much accepted that we have to download updates to our games consoles if we want them to work properly. But our Blu-ray players? That feels like a step too far. It's incredibly annoying to have to connect the player to our home networks or else download the update onto a DVD or USB drive and update the firmware. It just feels like an unnecessary faff.

Fix it: Well, you could just not, although that might mean not being able to play newer discs, depending on when your player's firmware was updated.



Bah! No Resume Play

Ever paused a Blu-ray to go to the loo or make a cup of tea or answer the phone or, you know, anything? With videos or DVDs, you'd expect to be able to resume playing where you left off when you came back to the film. But with some kinds of Blu-rays, you can't. If you stop playing a BD-Java disc or even leave it paused for too long, it won't resume where you left off. The function has been disabled, so you just can't stop once you start watching without having to dig through the scenes menu to find your place. Why? There's no obvious reason for it. You just can't.

Fix it: Some discs will let you set 'bookmarks' when you stop watching, so you can resume playing later, but the rest of them… you'll just have to remember where you were. Annoying. Really annoying.

Zzzz... Long Loading Times

This is a really petty whinge. But because there's so much more data stored on a Blu-ray disc than a DVD, it takes a lot longer for the feature to start playing when you put it into the player. And yes, 'a lot longer' is really just a matter of seconds, but when you're used to DVDs, it can feel like an age.

Fix it: Distract yourself: stick the disc in and then go and put the kettle on while it loads. You'll never notice the load times.

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